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- Up For Discussion

IWRC CONFERENCE 1998
Fort Worth, Texas
October 15-18, 1998

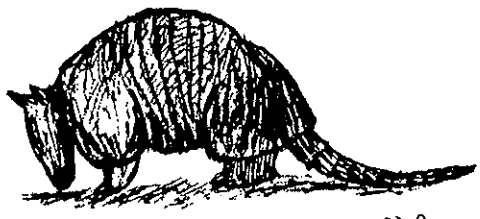
Join us for some "wild" times deep in the heart of Texas, when the IWRC celebrates its 26th year and its 21st annual wildlife conference! Our meeting this year is being held at the Radisson Plaza Hotel, in Fort Worth, Texas. Conveniently located in downtown Fort Worth, you are within walking distance of a variety of shopping areas, a 10 screen movie theater, comedy club, water gardens, an outlet mall, plus lots of eateries. The hotel itself boasts amenities: two restaurants on-site, *Cafe Texas* and the *Cactus Bar & Grill*; two lounges, the *Cactus Bar & Grill* and the *Skylight Court*; gift shop; beauty & barber shops; a heated outdoor pool; and on-site health club and sauna. It is within 15 minutes of many of Fort Worth's most famous attractions: The Stockyards, Tarantula Train, fine arts museums, Texas Ranger's Stadium, Six Flags Over Texas, and the Wet & Wild Amusement Park. There is so much to see and do here, "deep in the heart of Texas", that you will want to stay on and spend some extra time enjoying its unique cultures.

Our hosts this year are **Wildcare** of Fort Worth. They have been working very hard to assure that this meeting will not only be valuable as far as information and training sessions go, but fun and entertaining as well. Join our hosts, the IWRC Board of Directors, Executive Director, speakers and contributors, exhibitors, and of course your fellow rehabilitators at Thursday night's fun-filled ***Icebreaker Reception***. Make new contacts, share information, win door prizes, and dance to the DJ stylings of ***Wild Bill Cody***, while enjoying a light dinner compliments of our host group, accompanied by a no-host bar.

The theme of this year's conference focuses on, not only the individual species that we work with, but the conservation of their habitat, ecology, and the preservation of natural resources. Our **Keynote Speaker, Craig Sholley**, will open the meeting by speaking on the almost insurmountable odds that he and his team encountered in preserving a magnificent species and its habitat, the Mountain Gorilla. Renowned star and Director of The Shambala Preserve, **Ms. Tippi Hedren**, will discuss her program that focuses on preserving the big cats which have been hunted almost to extinction in many parts of the world, and what is being done to save them and their offspring. Her talk entitled "**The Wild Ones of Shambala**" will be presented during the annual **Awards Banquet** on Saturday evening.

You will definitely want to bid on some of the great items we have already had donated for our annual ***Silent Auction***, like a 'gently used' Ritter Explorer dental x-ray machine and a BioSonic Ultrasonic Cleaner with 3.8 liter tank. We will also be raffling off lots of other great items, as well as awarding our first annual attendance scholarships.

The year of 1998 has already seen a new excitement and energy within the IWRC. Come join us and help us carry on this momentum into the 21st Century and beyond! YOU are the International Wildlife Rehabilitation Council.



SEE YOU THERE!!

Drawing by Christian D. Reynolds

Journal

of Wildlife Rehabilitation

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Cover Photo: Kyoko (Matusmoto) Archibald, ICF
Lesser Sandhills Cranes at Bosque del Apache National Wildife Refuge, New Mexico.

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EDITORIAL

Where Do We Go From Here?

How old is wildlife rehabilitation? Probably as old as mankind itself. As long as man and animal have existed together, man has probably been caring for injured and orphaned wildlife. Wherever there has been a bird with a broken wing, a rabbit with a broken leg, or that ever-present baby bird fallen from the nest, someone, somewhere has taken it upon themselves to try and "save" that unfortunate animal. Granted, that many times the animal probably did not need our help, but the intentions were usually good. Hopefully, over these many years we have learned something about proper care and feeding of the rehabilitation animal.

Personally I have been involved in the field since the mid-1980s on a regular basis. However, as many of you, I have always had a love for wildlife and remember very early experiences with caring for baby birds, lizards, turtles, toads, snakes, a baby squirrel, and numerous homeless-type domestic animals (remember, "But Mom, it followed me home!")?

For many years, there was seemingly no interest from any quarter other than those that were actually involved in the day-to-day care of these creatures. As wildlife rehabilitation continued to grow, it became more and more in the public eye. Over the last 25-30 years, it has finally come to be considered a "profession". It has seen more interest and come under more scrutiny from other associated professionals and special interest groups, (e.g. biologists, naturalists, veterinarians, animal welfare groups, state and federal governmental agencies, humane animal associations, and the public in general).

The International Wildlife Rehabilitation Council, which last year celebrated its 25th anniversary, was there at the beginning. Since its inception, the organization has grown to include these diverse and interested parties. Along the way, there have been moments of pride and accomplishment, setbacks and sadnesses, losses and gains. Reasons to celebrate and reasons to mourn. We have acquired new members and lost some old ones. Yet, through it all, we continue to grow and learn. Our goal is, above all, education. Not an easy task, but a worthwhile one.

We look to you, our membership, as a source of information and encouragement. You who are out there, in the field, on the front so to speak, have the information that we seek and need. You who work directly with the animals, whether it be hands-on or through research and study, are the source. As an organization, we need to know about your experiences, your challenges, your accomplishments and your failures. Share the knowledge. What you learn IS important.

For the past 25 years, the IWRC has been supported by its membership dues, class fees, and literature sales. If we want to grow and expand, as we need to, we can no longer subsist solely on this source of revenue. It is not our intention to continually raise dues and registration fees, until members can no longer afford to support us. Although, from time to time, we must initiate small increases to cover rising costs of mailing

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Natural History and Rehabilitation of the Sandhill Crane (*Grus canadensis*)

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ABSTRACT

Sandhill Cranes are large, gray birds that are widely distributed in North America. Although Sandhills usually nest in water, they spend most of their time in uplands. Most Sandhill Cranes are migratory, but Florida has a substantial population of resident cranes. Because Sandhills are common in some areas, sick or injured individuals are frequently brought to rehabilitators. This article summarizes the species' distribution and biology, and treatment of its most important health problems. In addition, we describe techniques for raising chicks and strategies for releasing chicks or adults then back to the wild.

Key Words: sandhill crane, endangered, calls, vocalize, Migratory Treaty Act, chicks, release, relocation

Natural History

Description

The Sandhill Crane [Figure 1] is one of two crane species found in North America, the other being the critically endangered Whooping Crane. Belonging to the family *Gruidae* (order *Gruiformes*), Sandhill Cranes are diurnal omnivores which feed on a variety of plants and animals ranging from waste grains to invertebrates and small vertebrates (Meine and Archibald 1996). A typical adult Sandhill Crane has a wingspan of 6' to 7' (~2 m) and stands a little under 4' (~1.25 m) tall (Peterson 1980; Tacha et al. 1992). Its life span is approximately 25-30 years. A Sandhill Crane does not perch—its toes are ansiodactic: three point forward and one functionally vestigial hallux points backwards (Tacha et al. 1992). A Sandhill Crane's flight is distinguishable from other large birds by a slow downstroke and a snapped upstroke with the neck fully extended forward and the legs extending well beyond the tail.

Inconspicuously gray over its neck and body, a Sandhill Crane may further camouflage itself by using its beak to rub mud on its feathers (also referred to as "painting"), thus adding brown streaks. Other defining traits are a bright red, featherless crown, long legs, long neck, a bustle of tertial wing feathers, and orange eyes. There is slight sexual dimorphism, however, a size difference exists between sexes, males weighing in at approximately 8.17 lbs. (3.75 kg) and females at 7.31 lbs. (3.34 kg) for the Lesser Sandhill, *G. c. canadensis* (Johnsgard 1983).

Sandhill Cranes usually lay two eggs at two day intervals (Tacha et al. 1992). Migratory subspecies lay eggs in mid-spring, ranging from early April in southern Wisconsin to late May/early June in the Arctic Circle. Florida Sandhills lay eggs in mid-winter to early spring, while Mississippi Sandhills nest in March to May. Although many wild Sandhills raise two chicks at once, often only one of the two eggs hatches. The other egg may be laid for "insurance" in case the first does not hatch or the chick does not survive. The color of the eggs varies, ranging from pale brown to light olive with darker spots at the larger end. Incubation lasts about 30 days and is shared by both parents.

Sandhill chicks are precocial, hatching with open eyes, downy feathers, and the ability to follow their parents out of the nest after the first day. The chicks are brown and blend well with their surroundings. Developing rapidly (gaining 10%-20% of their weight a day at peak periods), by 3-5 weeks of age the chicks' wings and legs are about half of the adult size. Chicks stay with their parents for 9-10 months and are sexually mature at 3 years (Tacha et al. 1992). *Grus canadensis* has six subspecies: *G. c. canadensis* (Lesser Sandhill Crane), *G. c. tabida* (Greater Sandhill Crane), *G. c. rowani* (Canadian Sandhill Crane), *G. c. pratensis* (Florida Sandhill Crane), *G. c. nesiotes* (Cuban Sandhill Crane), *G. c. pulla* (Mississippi Sandhill Crane). It is possible to determine most subspecies by body measurements. Johnsgard (1983) and references therein, give the measurements of Sandhill Crane subspecies as follows:

Table 1: Measurements of Males and Females of Sandhill Crane Subspecies

Wing chord[1]	**Males**		**Females**	
canadensis	418-510 mm	(16.72-20.4 in)	420-500 mm	(16.8-20 in)
tabida	460-598 mm	(18.4-23.92 in)	467-510 mm	(18.68-20.4 in)
pratensis	460-533 mm	(18.4-21.32 in)	445-517 mm	(17.8-20.68 in)
rowani	482-525 mm	(19.28-21 in)	456-492 mm	(18.24-19.68 in)
Exposed culmen[2]				
canadensis	69-110 mm	(2.76-4.4 in)	80-103 mm	(3.2-4.12 in)
tabida	116-159 mm	(4.64-6.36 in)	113-147 mm	(4.52-5.88 in)
pratensis	113-144 mm	(4.52-5.75 in)	110-142 mm	(4.4-5.68 in)
rowani	109-127 mm	(4.36-5.08 in)	93-114 mm	(3.72-4.56 in)
Tarsus				
canadensis	156-228 mm	(6.24-9.12 in)	162-212 mm	(6.48-8.48 in)
tabida	225-265 mm	(9-10.6 in)	222-240 mm	(8.88-9.6 in)
pratensis	223-264 mm	(8.92-10.56 in)	220-257 mm	(8.8-10.28 in)
rowani	203-240 mm	(8.12-9.6 in)	210-215 mm	(8.4-8.6 in)
Weight				
canadensis	3,746 g	(8.17 lbs)	3,355 g	(7.31 lbs)
tabida	5,385 g	(11.78 lbs)	4,308 g	(9.44 lbs)
pratensis	4,081-4,988 g	(9.0-11.0 lbs)	3,741 g	(8.18 lbs)
rowani	3,500-5,200 g	(7.7-11.4 lbs)	3,775 g	(8.25 lbs)

[1] Wing chord is from the leading edge of the wrist to the tip of the longest primary.
[2] Exposed culmen is upper bill length from its tip to the first feathers at the bill base.

Habitat and Range

Sandhill Cranes summer primarily in open, freshwater wetlands, wet meadows, marshlands, and surrounding uplands. Other habitat types include bogs, grasslands, stubble fields, sedge meadows, and savannas. In winter they primarily use agricultural areas, and roost in water at night. The total number of Sandhill Cranes is around 500,000 (Meine and Archibald 1996).

Non-migratory Subspecies

The three non-migratory Sandhill Cranes [Figures 2-3] reside in southeastern United States and Cuba and include the following three subspecies:

•Florida Sandhill Crane *(G. c. pratensis)*

The main habitats of this subspecies include freshwater marshes in southeastern Georgia and through peninsular Florida (Tacha et al. 1992). This subspecies is considered stable, though borderlining on threatened, with numbers around 4,000-6,000 (Meine and Archibald 1996).

•Mississippi Sandhill Crane *(G. c. pulla)*

This subspecies is considered critically endangered by the IUCN Red List criteria. Its population hovers around 120 birds (Ellis et al. 1996). Only occurring in Jackson County, Mississippi, the birds are permanent residents in the swamps and savannas in and around Pascagoula Marsh (Meine and Archibald 1996; Tacha et al. 1992).

•Cuban Sandhill Crane *(G. c. nesiotes)*

Cranes of this subspecies inhabit the main island of Cuba and other nearby islands. They are found in drier habitats than other subspecies such as isolated savannas (Tacha et al. 1992; Meine and Archibald 1996). This subspecies is also considered critically endangered, its total population at approximately 300 (Meine and Archibald 1996; Nelson 1996).

Migratory Subspecies

Migratory Sandhill Cranes [Figure 4] breed primarily in northeastern Siberia and northern North America and winter in northern Mexico and southern parts of the United States (Meine and Archibald 1996):

•Lesser Sandhill Crane *(G. c. canadensis)*

These birds nest in northern Canada, Alaska, and eastern Siberia in bogs and riparian marshes. They winter from northern California to coastal Texas and northern Mexico, preferring lakes and marshes for night roosts and agricultural areas for feeding (Tacha et al. 1992).

•Canadian Sandhill Crane *(G. c. rowani)*

This is probably a transitional subspecies between Lesser (breeds in the Arctic) and the Greater Sandhill Cranes (temperate climates). It breeds throughout central Canada and winters with both Lesser and Greater Sandhills. Estimated numbers of the combined populations of *G. c. canadensis* and *G. c. rowani* are over 450,000 (Meine and Archibald 1996).

•Greater Sandhill Crane *(G. c. tabida)*

Represented by five distinct populations, this subspecies has breeding ranges throughout temperate North America:

1) Central Valley Population

With numbers between 6,000-6,800 and increasing, this population breeds in flooded meadows and marshes in northeast California and southeastern Oregon (Tacha et al. 1992; Meine and Archibald 1996).

2) Eastern Population

This population consists of more than 30,000 birds. Breeding grounds extend from eastern Minnesota, through Wisconsin, and into southern Ontario. These cranes prefer agricultural fields for feeding and open marshes or bogs for nesting. Wintering in southern Georgia and central Florida, the birds migrate through Illinois, Indiana, Ohio, Tennessee, and Kentucky, with a stopover at Jasper-Pulaski Fish and Wildlife Area in Indiana, where the cranes feed in corn stubble (Tacha et al. 1992; Meine and Archibald 1996).

3) Prairie Population

Including anywhere from 10,000-15,000 birds, the Prairie Population breeds in wet prairies and marshes. Its range is from northwestern Minnesota into western Ontario, Manitoba, and Saskatchewan (Meine and Archibald 1996).

4) Colorado River Valley Population

Breeding in river valleys, meadows, and marshes, this population is estimated anywhere from 1,400 to 2,100 birds and is considered stable. These cranes breed in northeastern Nevada and southwestern Idaho and winter along the Colorado River in California and Arizona. (Tacha et al. 1992; Meine and Archibald 1996).

5) Rocky Mountain Population

The Rocky Mountain population contains approximately 19,500 cranes. The breeding grounds span the border of Idaho and Colorado, extending up into southwestern Montana and down into northeastern Utah. There are also breeding grounds in central Idaho and western Wyoming. Migrating through Utah, Colorado and New Mexico, these cranes stop at a spring and fall staging area in the San Luis Valley in Colorado. Wintering grounds are centralized in the Rio Grande valley of New Mexico, though others are found in northern Mexico, southeastern Arizona, and southwestern New Mexico (Meine and Archibald 1996).

Mortality Factors

The list of a Sandhill Crane's natural enemies includes raptors, bobcats, raccoons, weasels, ravens and crows, foxes, and coyotes. Chicks are most often the target of predators, though sick or injured adults can also be subjected to an attack (Tacha et al. 1992; Ellis et al. 1996). In addition, human threats to Sandhill Cranes are significant. Habitat loss, power-line collisions, and collisions with motor vehicles cause many Sandhill Crane deaths per year (Safina 1993 and Brown 1992). Moreover, hunting is believed to have an impact on some populations, taking approximately 30,000 cranes a year in western North America and Mexico (Tacha et al. 1992).

Social Behavior

This section describes the complex behavior a Sandhill Crane may exhibit in captivity.

Chick behavior

A chick's behavior is largely dependent on whether it is raised alone or with other chicks. Sandhill Crane chicks are very aggressive towards each other until they are 4-6 weeks old. In the wild, if two eggs in a clutch hatch, one chick may often drive off or kill the other. Therefore, chicks should be kept separate until they are socialized under the caregiver's supervision (Refer to "Rearing Sandhill Crane Chicks").

Sandhill Crane chick vocalize using the *location call, stress call, food-begging call, and pre-flight call.* The *location call* is a soft, persistent, cricket-like trill. In the wild, the location call allows the parents to keep track of the chick. The *stress call* is similar to the location call, but is louder and shriller. It is most often heard when the chick is frightened or when attempting to get the parents' attention. The *food-begging call*

sounds like repeated stress calls, and stimulates the adults to feed the chick. Finally, the *pre-flight call* is mainly vocalized by older chicks who are fledging or post-fledged. It consists of a few loud, "questioning" blasts right before they begin to run and flap (Swengel et al. 1996; Nesbitt and Bradley 1997).

Aggressive behavior

An adult crane's aggressive behaviors operate to defend itself, its territory, and/or its chicks against intruders (usually other cranes) [Figure 5]. Low-intensity threats include *crown-expansion*, *crown-present*, and *directed-walk-threat*: an exaggerated walking movement with a stiffened gait, an extended neck, and the bill pointed at the intruder (Nesbitt and Archibald 1979). The *ruffle-bow-down-threat*, where the crane lifts its feathers and begins to shake until its whole body is shaking vigorously, is similar to the self-maintenance *ruffle-shake*, but can be determined a threat if accompanied by other aggressive behaviors (Swengel et al. 1996).

Higher intensity threats include the *ritualized-preen*, where the crane slightly drops one wing and places its bill between that wing and its back. The most aggressive display is the *crouch threat*, where the crane crouches on the ground as if it were incubating an egg, spreads its wings slightly, and points its bill down. The *crouch* may quickly escalate into a *rush*, *stomp* and *ruffle-bow* a few feet in front of the intruder, or into a full *attack* (Swengel et al. 1996). An attacking crane may *bill-jab* at the intruder and *jump-rake*, where the crane leaps into the air and uses its feet and claws to slash (Nesbitt and Archibald 1979).

If a crane is confronted by a predator, it will often give a *spread-wing display*, spreading its wings while pointing its beak at the threatening individual (Nesbitt and Archibald 1979).

The *unison call* and *guard call* (the latter being staccato-like blasts) usually occur before or after a crane's aggressive display in order to assert territoriality (Swengel et al. 1996).

If an adult crane is wild-caught and fearful of humans, it will probably not direct many aggressive displays towards the caregiver. However, adult cranes that have been raised in captivity may perceive humans as "pseudo-cranes" from whom the birds must defend itself.

Submissive behavior

Submissive displays are used by one crane to defuse aggression from another crane. A caregiver will most likely see the *cower*, where a crane retracts its neck and ruffles its neck feathers (Swengel et al. 1996). A form of the *pre-copulatory display*, which will be discussed in the following paragraph as a part of adult courtship, is also a submissive display observed in cranes of any age: the crane turns its back to the dominant individual and spreads its wings.

Reproductive behavior

Sandhill Cranes often mate for life. If an adult crane pair has a strong pairbond, they will exhibit *courtship* behavior which often leads to copulation: the *unison call*, the *contact call*, *dancing*, and the *pre-copulatory displays*. The *unison call* helps to establish and maintain the pairbond. In addition, the repetitious purr-like *contact call* allows the bonded pair to regularly assess the other's location (Nesbitt and Bradley 1997).

Dancing is a spontaneous behavior consisting of many threat displays chained together within a "courtship context". It is a significant component to establishing a pairbond. The cranes also engage in *pre-copulatory displays* where the male crane extends his neck, points his bill up at a 45 degree angle, and makes a guttural hoot-like call. The female turns her back to the male and spreads her wings fully which enables him to mount. At this point, the pair may copulate by pressing their cloacas together (*cloacal kiss*). However, pre-copulatory displays, though important for pair-bond maintenance, are not necessarily limited to breeding pairs.

During breeding season, cranes may engage in *nesting behavior*, *incubation*, and *care* for the chick.

REHABILITATION

Legalities

Sandhill Cranes are regulated by the Migratory Bird Treaty Act and by separate state laws restricting the capture and possession of wild birds. These laws are likely to affect Sandhills the same ways as most other birds, so rehabbers with permits covering other migratory species are likely to have the proper authorization to keep cranes.

Adults

The amount of space provided for the crane should depend on the crane's health problem, it's temperament, and the length of time it will be held. Recommended space for permanent housing of an adult crane includes a 1500

sq. ft. (140 sq. m) yard of natural turf for one crane, or 2,000 sq. ft. (185 sq. m) for two. If possible, flooding a small area or a dirt-bottomed pond can simulate the crane's natural habitat. Optimal fencing for the perimeter is 8'(2.4 m) high, vinyl coated 16 over 11 gauge aluminum, "knuckled", chain link. If chicken wire is used, cover it on the inside with tennis netting, reed matting, or plastic since the cranes can easily scrape themselves on the wire's many sharp points. The same visual barriers can be used on any fencing to decrease disturbance. Flight netting (2"/5cm mesh) attached to the top of the perimeter fence, elevated by guy wires that cross the pen at 12-16' (3.7-4.9 m) intervals, keeps the crane fully enclosed. Posts holding up the flight netting should be placed 15-30' (4.6-9.1 m) apart. A lockable gate is recommended for the caregiver's access in and out of the pen (Swengel and Besser 1996).

A shelter should be provided, either a four-sided house (10' x 10'/3 x 3 m), or, in warmer climates, a three-sided house. A sloped rooftop for drainage, a door to the yard and a separate door to the house for the caregiver's access are all recommended. Inside, a concrete floor covered by 3-4" (7.5-10 cm) of soft bedding (low-dust pine shavings or sand) acts not only as insulation, but also as important cushioning for the crane's feet and legs. To ensure the crane's safety from predators, electric wiring around the top of the fence and burying the bottom of the fence 18" (45 cm) are recommended (Swengel and Besser 1996).

For treatment of medical problems a pen approximately 64 sq. ft. (6 sq. m) and 7-8' (2.1-2.4 m) is recommended. Substrate should be chosen that is not slippery, and can be disinfected; turf, sand, wood chips, and non-slip flooring are possibilities.

Diet and Feeding Techniques

A crane in captivity needs to eat a comparably balanced diet to that which it would get in the wild. Though the specific nutrient requirements of a crane are not known, a gamebird pelleted diet containing 15-25% protein probably provides adequate nutrition. Alternatively, diets specifically formulated for cranes are commercially available (Swengel and Carpenter 1996). This should be supplemented with whole animal food (fish, baby mice,), chopped greens, and whole grains (such as corn, barley, and wheat) placed on top of the primary diet, especially while trying to acclimate the bird to captivity.

Cranes should have constant access to food unless pest problems or climate make this impossible. Daily food intake monitoring is essential, as a crane's lack of appetite may indicate illness or taste aversion.

Food can be provided in a shallow pan or a bucket (which may need to be secured 18" (45 cm) high on a fence or wall to prevent spillage). Wild cranes may take several days to adjust and begin eating unfamiliar feed when first entering rehabilitation. Captive cranes adjust to containers that sit low to the ground better than high ones at fist, so try a low pan if the crane isn't eating out of taller buckets.

A crane should have fresh water at a all times. If a water bucket is provided, make sure the cranes are using it. A pole water heater will hold the bucket in place and prevent the water from freezing in colder climates; bricks can also be used to stabilize a bucket or pan of water.

Chicks

Networking

To help ensure the proper imprinting of a Sandhill Crane chick, it is preferable to raise and/or house a chick with or adjacent to members of its own species. This may require finding another rehabilitator who is presently housing Sandhill Cranes and willing to take on another. This approach will increase the likelihood that each individual crane will be as properly imprinted as possible, and releasable into the wild. Raising a chick in a pen adjacent to another chick or to adult Sandhill Cranes will improve species recognition and benefit social development. And, if chicks are socialized with each other or adopted by adults, the birds can be released together which increases their chances for survival. If the caregiver hand-raises a lone chick, it is likely it will be not be releasable due to human imprinting. It is then a good idea to contact zoos in the area since many are interested in even the most common subspecies of Sandhill Crane (Ellis et al. 1996).

Estimating Chick Age

It is possible to estimate the age of a Sandhill Crane chick by its weight. Using the chart in Figure 6 (the data are from Florida Sandhill Crane chicks but function also for subspecies, except for Lesser Sandhills), can be used to estimate age up to 30 days. An older chick's age can be estimated by feather development and size. Flight feathers start growing in at 4 weeks of age, and the primaries are full size but still contain blood in them by 50 (Lesser Sandhill) to 65 (other subspecies) days of age. Based

on the chick's approximate age, it is possible to keep its environment at the appropriate temperature (Wellington et al. 1996).

Handling

Proper handling of crane of any age is critical in avoiding injuries to the crane and to the handler. Many cranes will be calmer and less dangerous when handled if a soft cloth hood (even a sock with a hole in it for the beak) is slipped over the head. Make sure that the nostrils are not covered and that the crane can open its bill a little to "pant." For transport, cranes should be crated in a tall narrow box (**not bagged**); transport box designs are available from ICF.

Scoop Method

For chicks one week of age or less, the scoop method is recommended. The caregiver holds the chick on the palm of the hand like a baseball, the chick facing the caregiver. Its legs should dangle free while at least one of the caregiver's fingers is placed between the legs in order to avoid friction injury (a chick may kick and rub its legs together). The other hand can lightly cover the chick's back so that it doesn't jump.

A **transitional** handling method incorporates both the "scoop" and "football" method (described in the next paragraph) and works best for handling chicks between the ages of a week and approximately 1 1/2 months. The caregiver uses one hand to hold the chick's legs, folded, with two fingers placed between and just below the hocks. The other hand can then gently, but firmly, contain the chick's wings in their natural folded position (Wellington et al. 1996:80).

Football Method

The football method should be used for handling a crane over 1.5 - 2 months of age and for adults. Wear goggles to avoid eye and face injuries when handling older cranes. To capture a crane, it is helpful to have more than one person herd the crane into a protected corner. With the crane's head pointed to the side, bend over and gather its legs with one hand and place two fingers placed between the legs just below the hocks (to avoid rubbing the hocks together). Before lifting, make sure the crane's wings are tucked in and laying properly against its body. Apply gentle pressure to the its legs until the crane allows you to lift its legs up and fold them under the body. Do not force the legs into position! The caregiver's other arm should simultaneously be reaching over the crane's back to take the folded legs, keeping two fingers between them. Ultimately the crane is supported on the hip like a football, both the body and legs held under one arm. Alternatively, the legs can be held loosely extended with your other hand supporting the hocks. (The other hand holds the crane's outermost wing against its body.) In all of the above methods, the caregiver should be careful not to injure the crane by forcing the legs or other parts of the body into position (Wellington et al. 1996:81).

Rearing Chicks

Though rare, it can happen that a Sandhill Crane chick is orphaned. If one is found and is in good health, the caregiver might first ask people who live around the area if they know of a pair of resident adult Sandhill Cranes. If so, the caregiver may want to leave the chick where it was found and watch to see if the adults return. If a chick is clearly sick or injured it is probably best to remove the chick from the area for rehabilitation. Keep in mind that a rehabilitated chick's chance of surviving in the wild will be enhanced if it retains some fear of humans.

Hand-raising Chicks

The caregiver may need to hand-raise a chick that is very young. Understanding a chick's behavior, estimating a chick's age, and feeding techniques were discussed earlier.

Though it has been done, a chick raised by hand with no interaction with other Sandhill Cranes is unlikely to survive in the wild. Not only may the chick become imprinted on humans to the extent that it may not mate with another of its own species, but it will likely lack the learned skills necessary for survival. Therefore, a chick that is hand-raised without conspecifics to imprint upon should most often remain in captivity.

Exercise is extremely important for chicks in captivity to avoid leg and toe problems. For hand-reared chicks, a fenced-in exercise yard as large as the caregiver can provide and separate from the chick's pen, is an excellent addition to chick-rearing facilities. This yard must be secure from cats, dogs, and other daytime predators. If a yard is not available take the chick on walks. Watch the chick around the time it fledges (60-75 days) so that it does not fly away. To encourage the chick to follow the caregiver, wear an identifiable article of clothing each time, use the puppet, and vocalize a "brrr" sound. Chicks that are raised adjacent to

or with conspecifics will likely get adequate exercise following the other crane and/or pacing the fence that separates the birds (Wellington, personal communication).

Hand-raising More than One Chick

Chicks raised together, and that are not too tame towards people, are good candidates for release since they are likely to be properly imprinted (Swengel, personal communication). However, when raising more than one chick it is essential they are kept separate until thoroughly socialized with one another. To socialize chicks, they should be placed in neutral territory. Provide separate feeding stations (one for each chick), and supervise the chicks closely so you can break up any squabbles that arise. During the socialization process, a linear dominance hierarchy forms and aggression between chicks diminishes, almost disappearing by 3 months of age (Derrickson and Carpenter 1980). The caregiver then should use his/her best judgment when and if to keep the chicks together based on the level of aggression.

Foster-parenting

Raising a Sandhill Crane chick in a pen next to or with a "foster-parent" will also increase the chick's odds of survival in the wild. The chick is likely to imprint properly and, if raised by wild Sandhill Crane adults learn the important, necessary skills for survival. Another benefit of foster-parenting is that the chick will receive adequate exercise. By the time a chick is eating on its own, the caregiver can place the chick in an adjacent pen to its foster-parent(s): a single adult Sandhill Crane, a bonded pair of adult Sandhill Cranes, or domestic birds such as chicken, geese, ducks, or turkeys. For proper imprinting of the chick, if another species of bird is used as a foster parent, make sure that the chick gets exposed to or sees Sandhill Cranes for several days before releasing the chick to the wild. Wild chicks have already been exposed to their parents, so are likely to have reasonably good imprinting already. Another option is attempting an "adoption" where the chick is raised in the same pen with any of the aforementioned parents. The first method may be most practical since an adoption can take a lot of time and is risky since adults, especially cranes, may injure or kill the chick. If the caregiver attempts an adoption between and adult Sandhill Crane and a chick, two main factors contribute to success: the chick's age and the chick-rearing history of the adult(s). Sandhill Crane adults are more likely to adopt a chick under a week of age. Furthermore, the odds of an adult accepting the chick increase if the adult is a) incubating eggs, b) has recently hatched a chick that died or disappeared, or c) has hatched and raised chicks before but is presently not incubating or rearing. And, in any of these scenarios a successful adoption is more likely if the individual or pair have laid eggs in the past (Wellington et al. 1996; Swengel, personal communication).

To begin the adoption, a chick should be socialized with the Sandhill Crane adult(s) under close supervision. Place the chick and adult in adjacent pens and observe the adult's behavior towards the chick. Positive, accepting behaviors to watch for include vigilance, close physical proximity, feeding through the fence, and sitting close to the chick with spread wings. Aggressive, non-accepting behaviors include stabbing at the chick and scraping at the fence.

If the Sandhill Crane adult(s) appears to accept the chick, let the chick walk into the adult pen. Remove the chick immediately if the adult(s) show any aggression towards it or if the chick runs away and/or is stress-peeping (refer to "Chick behavior"). If the adult accepts a chick, it is still important to observe the birds at regular intervals for signs of aggression (Wellington et al. 1996). If the adult rejects the chick, the chick can live adjacent to it.

Before allowing the chick to live near or with an adult bird, one should modify ordinary chain link fencing. Small plastic mesh (1"/2.5 cm) attached to the fence, running from just below ground and up to 12"(30 cm) above ground, is recommended. This will keep the chick from squeezing through the holes and/or becoming injured by an aggressive adult's beak. Also, flight netting fitted across the top of the chick's pen is a good safety measure.

The caregiver may have a female chicken, duck, goose, or turkey that exhibits maternal behavior (such as feeding and protection) towards a Sandhill Crane chick. If so, try housing the chick in an adjacent pen or attempting an adoption with one of these birds as foster parents.

Facilities

Proper housing for a Sandhill Crane chick will help ensure the chick's environment stays at the proper, consistent temperature essential for a very young chick's health.

The chick should be kept in a brooder box until it is at least a week old. Lay outdoor carpeting free of frays and loops on the floor of the brooder box. To heat and monitor the temperature of the box, attach a heat lamp to the top,

out of reach of the chick, and place a thermometer on the floor. During the first week of a chick's life, the temperature should be kept at 95-98°F. It can be decreased by five degrees each week thereafter. However, do not allow it to drop below 70° until the chick is at least 3 weeks old. When housing more than one chick, they should be kept separate until socialized since crane chicks are quite aggressive. Place a taxidermically mounted head or a crane puppet in the corner of the brooder box. The chick will likely appreciate the surrogate parent and sleep near it at night (Wellington et al. 1996).

Chicks over a week old need an indoor/outdoor, covered, connected pen. The indoor part of the pen should be 6' (1.8 m) wide and 6-15' (1.8-4.6 m) long. The outdoor part should be larger, 6-8' (1.8-2.4 m) high, and covered with flight-netting or a soft fencing material. Running 1/4" (0.6 cm) mesh along the bottom of the chain link fence, high enough that a chick can't stick its head and neck through, will help prevent injury. For temperature regulation, there should be an access door between the inside and outside pens that shuts without gaps in which the chick's head might get stuck. For the first few weeks in the pen, it is still comforting for the chick to have the taxidermy head or puppet nearby (Wellington et al. 1996)

Diet and Feeding Techniques

The diet offered to a crane chick should be 20-25% protein, with a calcium/phosphorus ratio of at least 1:1. Crane chicks are prone to limb deformities associated with too rapid growth. Reducing the sulfur amino acids (cystine and methionine) in the diet have been shown to help control the rate of weight gain. Commercial pelleted crane starter diets are available (Swengel and Carpenter 1996). Alternatively, look for a gamebird or turkey starter diet that meets these guidelines. Insects (waxworms, mealworms, etc.) and chopped greens can be offered as supplements.

If a chick is under a week old and not already eating and drinking on its own, the caregiver should begin teaching it right away. To do so, it is best to provide a surrogate parent: a Sandhill Crane puppet. It can be constructed from any soft, gray material, should include a red patch on the "head" and well-attached plastic or glass eyes, and be long enough to cover the caregiver's arm (Wellington et al. 1996). Hold a red spoon in the puppet's beak (try a black spoon if red doesn't work) while imitating the brood call (say "brrr" and trill the "r"). Pick up wet, crumbled pellets in the spoon and offer to the chick. Crane chicks are usually attracted to red, so it should peck at the spoon, thus getting a beak-full of food.

After the chick is consistently eating from the spoon, use the puppet to coax the chick over to the food bowl. Dip the spoon into the food and feed the chick directly over the bowl. Then, gradually lower the spoon until the chick is eating directly from the bowl. It may take the chick a few days to get the hang of it. Offer the chick food 5-6 times a day until it is eating on its own and gaining weight consistently. A chick should begin to gain weight when it is 4 days old. It is recommended to weigh the chick daily: a 5-10% weight gain per day is considered healthy for the average Sandhill Crane chick. Although animal protein such as fish should be limited for chicks, cracked corn or worms sprinkled over the top of the pellets may help a chick of any age begin to recognize pellets as food (Wellington et al. 1996).

In conjunction with feeding, a chick may also need help learning to drink. Encourage the chick to drink every time it eats. With or without the spoon, use the puppet to coax the chick over to its water bowl (a small dog dish). Move the puppet's beak in the water to attract the chick's interest. Marbles in the bottom of the water bowl may also receive the chick's attention, however, remove the marbles as soon as the chick is consistently drinking on its own (Wellington et al. 1996).

HEALTH CARE

The use of some medications and treatment techniques recommended here should be overseen by a veterinarian or other qualified professional, preferably with experience caring for wild cranes. Many of the medicines are prescription drugs, and can only be dispensed with permission of a licensed veterinarian.

Common medical problems for which adult and sub-adult Sandhill Cranes are presented to rehabilitators include injuries to the wings, legs or beak and debilitating infectious and toxic diseases. An adult crane is generally severely debilitated by the time capture is possible. Even cranes with wing injuries that prevent flight are often able to elude capture by running.

Transporting an injured crane can be difficult. Transport crates designed for cranes are tall enough so the bird can stand with its neck in a comfortable "S" shape, but narrow enough so the bird does not fall far before catching the side wall and being able to right itself. Ventila-

tion, a non-slip floor, and a soft substrate are, of course, provided. Portable pet carriers are generally not tall enough for cranes, and should only be used if the crane is unable to stand and remains calm sternally. If an appropriate crate is not available and the transport time is relatively short, place a hood on the crane's head and hold the crane as described above during the transport. It is dangerous to restrain a non-sedated crane in a sack or harness; capture myopathy is common when this is done.

Capture myopathy can occur during capture and handling of cranes; extended muscle restraint and stress are factors in this degenerative muscle disease. Signs of capture myopathy include an abnormal gait, inability to fly or drooping wings, inflamed muscles, lethargy and death. A significantly elevated serum level of creatine phosphokinase (CK), an enzyme that muscles secrete when damaged, must be found to confirm the diagnosis. *See Appendices 1-2 for normal hematologic and serum chemistry values of captive Sandhill Cranes.* There is no specific treatment, but fluid therapy, steroids, sodium bicarbonate, and vitamin E/selenium have all been recommended to limit the progression of the disease.

The initial evaluation of all injured and sick cranes should include estimation of hydration and nutritional status. As with all injured wildlife, *dehydration is common, and needs to be corrected immediately* if rehabilitation is going to succeed. A standard approach to fluid therapy is used (Redig 1984); 3-5% of body weight (as cc's of fluids such as Lactated Ringer's solution) can be given immediately, as an IV bolus, through an intravenous or intraosseous catheter or subcutaneously. Since cranes are often captured after being sick or injured for days, they often are in poor nutritional condition. Wild cranes will often be slow to adapt to eating in captivity. Nutritional support by gavage feeding (Olsen et al. 1996) is indicated if a crane arrives in poor condition or does not maintain its weight during rehabilitation. A variety of "tube-feeding" formulations can be used; ICF has had good success with a mixture of a human enteral product (Ensure™ is one example) and a formulated crane or gamebird diet.

Leg and Wing Injuries

Fractures or soft tissue injuries of the wing or leg are a common presenting problem in adult cranes. Causes for these injuries include collisions with moving vehicles or power lines, trap injuries, or, more rarely, non-lethal encounters with predators, including gunshot wounds. Initial care should include controlling bleeding and applying a support bandage: a figure-8 bandage for a wing fracture (which may include wrapping the wing to the body if the fracture is of the upper wing), or a padded bandage to cover a leg fracture.

The crane should be examined by a veterinarian as soon as possible. Surgical fixation of fractures or repair of injuries will usually be needed to get full return of function of the limb, which is critical for the crane to be released. Figure-8 bandages are rarely adequate for proper healing of wing fractures; stiffening of wing joints or shortening of the patagium (wing web) are common complications that can prevent the release of the crane. Foot injuries in cranes are more forgiving; cranes can do well with permanently deformed toes and toe amputations, as long as their gait is not severely affected. As with all flighted birds, physical therapy is a critical part of the rehabilitation of cranes with wing injuries. Passive manipulation and housing in large cages where "flight runs" are possible are recommended.

"Bumblefoot" does occur in cranes, usually the result of an injury to one leg, and resulting increased weight bearing on the footpad of the non-injured leg. Rough or hard substrates can also contribute to the problem, and should be avoided in captive pens. Treatment approaches developed for raptors (Riddle 1980) have been used in cranes, though bandaging methods must be adapted for the non-perching flat foot of the crane.

Other Injuries

Beak fractures, relatively rare in wild cranes, are regularly seen in cranes in captivity, as they poke their beaks through fencing material or jab at caretakers. Paying attention to the choice of pen materials and using smooth materials as visual barriers can help reduce this risk. If the beak fracture includes more than just the tip of the beak, profuse hemorrhage is common and must be controlled with a combination of pressure, hemostatic powder or solution, and cyanoacrylic glue to seal the fracture line or stump. If the fractured portion is still attached, fracture fixation techniques (pinning, plating, external fixators) can be used. If the beak fracture is complete and results in a big (more than 3-4 cm) discrepancy in length of the 2 sides of the beak, the bird may have trouble eating. In these cases, applying a prosthesis until the beak grows out (not all do) or shortening the other side

by surgical cutting can be considered.

Spinal cord trauma and other kinds of nerve damage are occasionally seen in cranes. The spinal cord injuries usually result from a collision with a stationary object, and are often severe; full recovery is rare, so euthanasia is usually indicated. Peripheral nerve damage, from trauma or frostbite, can present as knuckling on a foot or a droopy wing. There is no specific therapy. Supporting the limb in a normal position (a snowshoe splint for a foot, a figure-8 wing and body wrap for a wing) over many weeks can result in a return of function.

Infectious Diseases

A variety of bacterial diseases have been reported in wild sandhills (Langenberg and Dein 1994), including salmonellosis, avian cholera (*Pasteurella multocida*), and *E. coli* infections. All of these will respond to appropriate antibiotic therapy (Olsen et al. 1996). It is important that the crane also be evaluated for other underlying health problems, and that a complete prerelease health evaluation be done so that the bird does not become a shedder who puts other wild birds at risk on release. Avian tuberculosis also occurs in wild cranes; common signs are chronic debilitation, anemia, elevated white blood cell count (with monocytosis), and gastrointestinal or hepatic enlargement or masses. Though multidrug anti-tuberculosis treatment has been attempted in cranes, its success has not been proven. Therefore, a crane with a definitive diagnosis of avian tuberculosis should probably not be released; euthanasia should be considered.

Aspergillosis occurs in cranes, usually as a secondary problem for a bird immunocompromised by concurrent disease, nutritional problems, or stressed by captivity. The presenting signs, recommended diagnostic methods, and treatment are generally the same as for other birds (Altman 1997). Nebulization therapy is difficult in adult cranes, because of their size, but it is possible in younger birds, or if you have access to a relatively airtight cage (such as a dog cage with a Plexiglas front). Because sandhill cranes have an intra-sternal tracheal loop, *Aspergillus* plugs of the trachea are particularly hard to diagnosis and treat. A more acute, diffuse pulmonary form of aspergillosis ("brooder pneumonia") has been seen in very young crane chicks. In this form, the signs are suggestive of pneumonia, and rarely are "bread mold" plaques on the airsacs seen.

Viral diseases which have been identified in wild Sandhills are avian pox and eastern equine encephalitis (Olsen et al. 1996). There is not evidence that these are significant mortality or morbidity factors for Sandhills, and they will be rarely encountered by rehabilitators.

Parasites that are commonly encountered in North American cranes include coccidia, gapeworm (usually *Cyathostoma* sp.), a variety of other nematodes (*Dispharynx, Capillaria, Strongyloides*) and ectoparasites such as mites and lice (Olsen et al. 1996). Cranes have an extra-intestinal form of coccidiosis, called disseminated visceral coccidiosis (DVC), where the protozoa disseminate to the lungs, liver, and other parts of the body. This form can be devastating in chicks. Coccidia-infected individuals can be treated with amprolium or trimethoprim-sulfa type drugs; amprolium and monensin incorporated in food or water can help control reinfection. Gapeworms and many of the nematode parasites can be successfully treated with ivermectin and/or a benzamidazole anthelmintic (such as fenbendazole). Ectoparasites can also be treated with ivermectin, or a insecticidal dust such as 5% carbaryl or 0.10% pyrethrin. See Olsen et al. (1996) for dosage recommendations.

Toxicologic Disorders

Mycotoxicosis occurs when cranes eat moldy peanuts or grains containing a fungus which is producing a toxin (aflatoxin, ochratoxin, trichothecene, etc.) (Langenberg and Dein 1994). This has occurred in the southern states when Sandhills feed on crop waste left in the fields over-winter and can be prevented by plowing under the fields after harvest. Signs include extreme depression, droopy wings, and inability to fly. Aflatoxins have also been associated with liver damage and neoplasia. There is no specific treatment. Any remaining ingested food should be flushed from the GI tract, and supportive care should be provided.

Lead poisoning has been reported in wild cranes who have ingested lead contaminated objects such as fishing weights or gunshot, though it not as common in cranes as in ducks, geese, and swans. Zinc poisoning is common in captive cranes who seem to be "metal detectors" who frequently ingest fencing materials or other metals that contain this toxic heavy metal. Ingested metal can also cause problems by perforating the GI tract. Presenting signs for heavy metal poisoning are non-specific, including depression, anorexia, green watery diarrhea, droopy wings, and abnormal swallowing or gaping motions of the mouth. Removal of the metal objects in the GI tract and chelation therapy are

recommended (Altman 1997).

Though botulism is not as common in cranes as in anseriformes, this paralytic disease caused by ingestion of *Clostridium botulinum* toxin should be considered. Affected birds present with flaccid paralysis of the neck, wings, or legs. The specific anti-toxin is not easily available; some birds will recover with supportive care.

Chick Health Problems

Many of the traumatic, infectious, and toxicologic problems discussed above will be seen in crane chicks. Additionally, developmental limb problems, such as rotated legs, crooked toes, and "angel wing" are often seen in orphaned chicks who are being hand-reared. Though the theory of treatment for these problems is simple — replace the affected portion of the limb in a normal position, so that as growth continues the limb will straighten — this management is often unsuccessful. Therefore, it is important to prevent these problems by providing adequate exercise, an appropriate substrate, and a diet with controlled, specific levels of protein to limit the rate of weight gain — all things that parent cranes, even foster-parents in captivity, naturally provide. (See earlier section on **Rearing Chicks**.) For rotational deformities of chick legs, tension taping of the rapidly growing side of the leg at the hock (i.e. the outside of the curve) can be effective in slowing the growth on that side of the growth plate and allowing the leg to straighten out — *IF it is done at a young age* and as soon as the abnormal position of the leg is noted (Wellington et al. 1996)

Zoonoses

There are not large zoonotic risks associated with working with cranes. Possible zoonotic organisms, such as *Mycobacterium avium* (the cause of avian tuberculosis), *Salmonella*, and *Campylobacter jejuni* are carried by cranes. However, these organisms do not commonly cause human disease unless the person is immunocompromised, and there are no documented reports of human cases associated with crane contact.

REINTRODUCTION

Since hand-rearing a Sandhill Crane chick will often result in a crane suitable for survival only in captivity, cranes that are best suited for release are foster-reared chicks, chicks raised adjacent to or with another, or rehabilitated wild adults. Foster-reared chicks can be reintroduced into the wild since they often exhibit proper sexual imprinting, learn foraging skills from their parents, and can become wary of humans. Adults temporarily living in captivity for rehabilitation are likely to quickly readjust to life in the wild (Nagendran et al. 1996; Swengel, personal communication).

There are two types of release: *abrupt* and *gentle*. It depends on the crane's captive history when determining which method is best suited for the individual bird.

1) *Abrupt release* entails releasing the crane(s), without a period of acclimation, into an area where other Sandhill Cranes congregate. This method is best for wild adults that are housed temporarily for rehabilitation and are being released where they were found.

2) *Gentle release* entails releasing the healthy, fledged crane(s) near a flock of Sandhill Cranes, usually a staging area (there are usually several staging areas per regional crane population), thus allowing more opportunities to attempt a release. Contact your Department of Natural Resources for listings and maps of staging areas. This method is ideal for foster-reared chicks, since it allows the crane to acclimate to the new environment.

If the caregiver's backyard is adjacent to an area where wild cranes feed or congregate, the crane(s) can be released from there. The crane will need a safe place near the release site to return for the night. If the crane is released from a place other than the caregiver's backyard, it is necessary to build a release pen up to 0.1 acres (snow fencing is adequate) yard with an open top. The crane will begin to come and go, and may soon join a flock (Nagendran et al. 1996).

Other possible scenarios are as follows: A fledged crane that has been raised by a single or a pair of Sandhill Cranes in captivity can be released with the adult(s) using either method (assuming the parents are wild). When a fledged crane raised adjacent to or with other Sandhill Cranes or domestic fowl and is released alone, gentle release is advised. Finally, a fledged crane raised by domestic fowl and has had minimal human contact can be released into a flock of Sandhill Cranes using either method, though gentle release is preferred. Though the crane may be partially imprinted on a different avian species, the crane is likely to join members of its own species once introduced. And, if a crane has an injury that may affect its survival in the wild, the caregiver should use their best judgment in deciding whether or not to release the bird.

Contact a vet who is knowledgeable in this area and talk with other Sandhill Crane rehabilitators for more information regarding such a release.

Health evaluations should be done on all cranes before release. This should include a complete physical exam, a fecal exam for parasites, blood work (if possible), and screening for any infectious diseases to which the bird might have been exposed. Additionally, all released cranes should have leg bands, so their fates can be tracked over time.

Conclusion

For further information on crane husbandry, consult the manual *Cranes: Their Biology, Husbandry, and Conservation*, co-authored by the International Crane Foundation (ICF) and Patuxent Wildlife Research Center, and available through:

Hancock Wildlife Research Center
1431 Harrison Avenue,
Blaine, WA 98230-5005
To order by phone: (800) 938-1114
Fax: (800) 983-2262
Email: hancock@uniserve.com

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Adult Greater Sandhill Crane, Great Lakes Population
Photo by George Archibald, ICF
Figure 1.

Author Profiles

Megan Lauber grew up in Eau Claire Wisconsin. She earned a Bachelor's degree in English and a Certificate in Environmental Studies at the University of Wisconsin-Madison. During college Megan won awards for her poetry. She developed a great love of birds and has kept cage birds for over a decade, especially Cockatiels and Lovebirds. During 1997-98 Megan worked two stints as an Aviculture Intern at ICF, where she received intensive training in crane husbandry, with special emphasis on artificial insemination. She is now a Bird Keeper caring for a variety of birds and mammals at the Freeport McMoRan Audubon Species Survival Center, outside New Orleans.

Julie Langenberg is the staff veterinarian at the International Crane Foundation, and provides health care for their flock, which includes all 15 species of cranes, and breeding populations of the most endangered species. She has contributed to many publications on the diseases and health management of cranes, and works closely with reintroduction and field research projects around the world. She teaches wildlife and avian medicine at the University of Wisconsin School of Veterinary Medicine.

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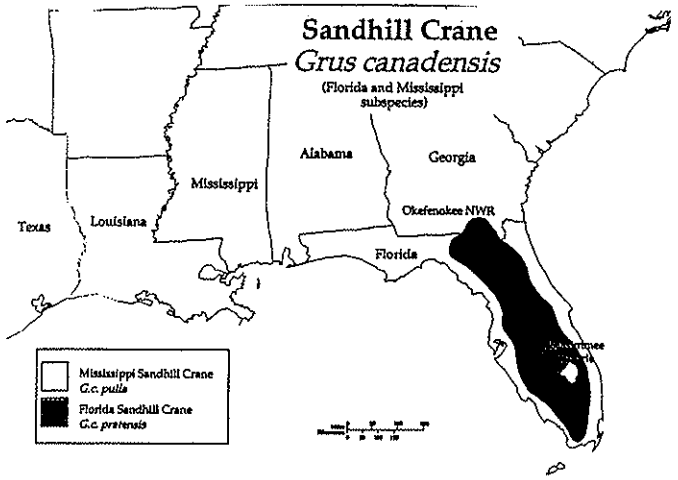


Figure 2: Map of Florida and Mississippi subspecies. Reprinted from Meine and Archibald, 1996.

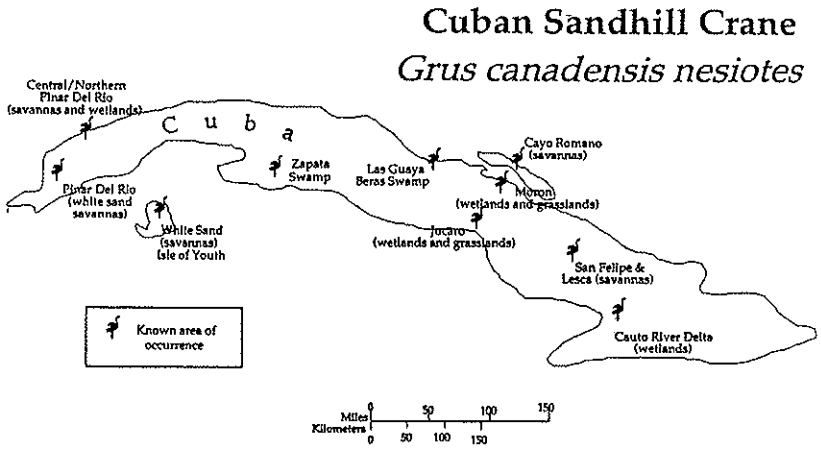


Figure 3: Map of Cuban subspecies. Reprinted from Meine and Archibald, 1996.

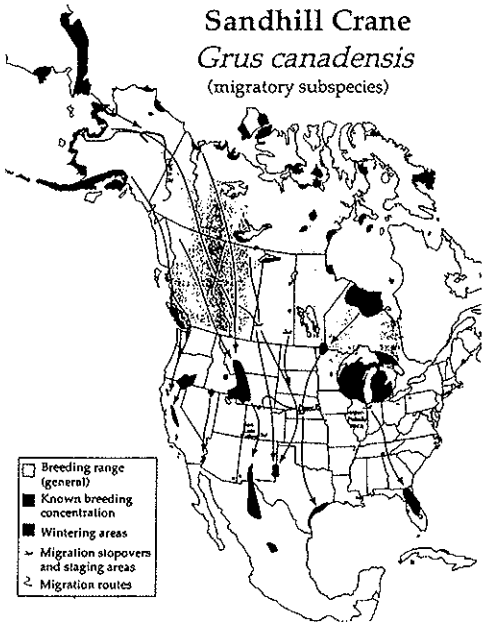


Figure 4: Sandhill Crane (*Grus canadensis*), migratory subspecies. Reprinted from Meine and Archibald, 1996.

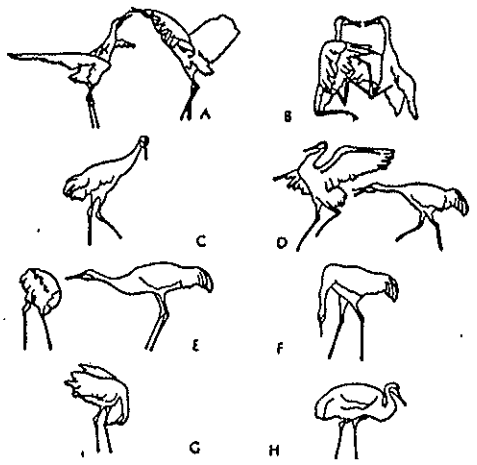


Figure 5: Common Agonistic displays of the Sandhill Crane (*Grus canadensis*): (A, B) Bill Sparring; (C) Directed Walk Threat; (D) Head Lowered Charge; (E) Bill Stab; (F) Low Bow; (G) Generalized Body-Wing shaking; (H) Neck Retracted Submissive Posture
Reprinted by permission from Nesbitt and Archibald, 1981.

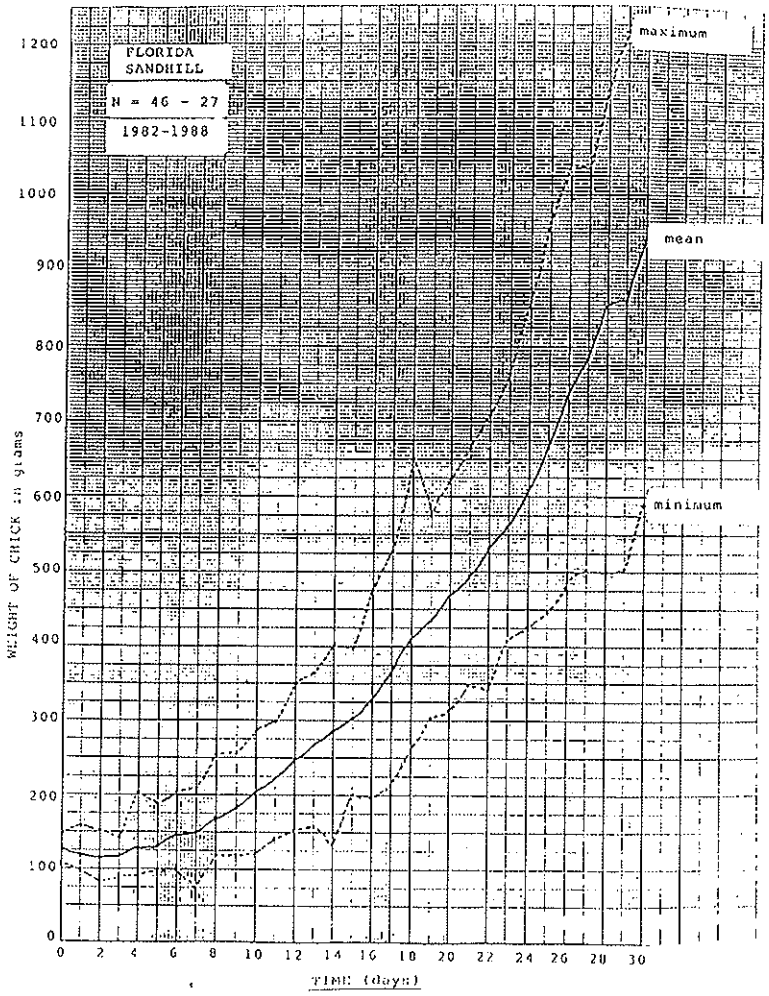


Figure 6: Florida Sandhill Crane Chick Weight Chart. ICF. Unpublished data, 1982-1988.

APPENDIX 1. Normal white blood cell hematologic values (left columns; mean, standard deviation, range) and hematologic and serum chemistry values (right columns; mean and range) for captive Sandhill Cranes. Adapted from Olsen et al. 1996.

	Sandhill Crane N=5
White Blood Cell (N/µL)[2]	13430
SD	4626
Range	8392-20900
Heterophil (%)	53
SD	2
Range	50-56
Lymphocyte (%)	40
SD	3
Range	38-43
Monocyte (%)	6
SD	4
Range	3-13
Eosinophil (%)	2
SD	1
Range	0-3
Heterophil (N/µL)	7078
SD	2385
Range	4448-10868
Lymphocyte (N/µL)	5353
SD	2136
Range	3609-8987
Monocyte (N/µL)	802
SD	515
Range	334-1544
Eosinohil (N/µL)	210
SD	204
Range	0-418

[1] *Basophils were absent in samples.*

	Sandhill Crane	
	Mean	Range
Hematocrit (%)	43.0	37-49
Hemoglobin (g/100mL)	13.5	10.5-18.7
Red Blood Cell (10^6/mm^3)	2.5	1.9-3.3
White Blood Cell (10^3/mm^3)	13.0	6.2-22.6
Total Protein (g/100mL)	3.9	2.9-7.9
Albumin (g/100mL)	1.5	1.0-2.5
Globulin (g/100mL)	2.3	1.8-3.4
Albumin/Globulin	0.6	0.4-1.3
Alkaline Phosphatase (IU/L)	164.0	34-423
Lactic Dehydrogenase (IU/L)	278.0	108-488
Aspartate Aminotransferase (IU/L)	181.0	16-260
Alanine Aminotransferase (IU/L)	50.0	19-162
Glucose (mg/100mL)	247.0	87-323
Uric Acid (mg/100mL)	9.7	4.1-24.6
Creatinine (mg/100mL)	0.7	0.4-1.2
Cholesterol (mg/100mL)	128.0	87-187
Creatine kinase (U/L)	—	—
Triglyceride (mg/dL)	—	—
Iron (mg/dL)	—	—
Calcium (mg/100mL)	9.7	8.8-10.9
Phosphorus (mg/100mL)	3.6	1.7-5.4
Sodium (mEq/L)	148.0	142-160
Chloride (mEq/L)	108.0	101-115
Potassium (mEq/L)	3.4	2.2-4.8

APPENDIX 2. (Adapted from Olsen et al. 1996)

Pediatric hematologic and serum chemistry values (mean; range) for captive Sandhill Crane chicks.

AGE IN DAYS	0-2	6-8	13-15	20-25	27-29	34-36
Hematocrit (%)	33; 27-37	28; 23-30	28; 25-30	29; 25-33	28; 24-35	28; 25-32
Red Blood Cell Count (10^6/mm^3)	1.47; 1.22-1.71	1.31; 1.12-1.52	1.30; 1.09-1.48	1.32; 1.14-1.59	1.37; 1.18-1.65	1.32; 1.17-1.56
Mean corpuscular volume (MCV) (Fl)	217; 206-231	216; 187-235	206; 190-235	212; 195-235	208; 185-223	215; 192-235
White Blood Cell Count (10^3/mm^3)	20.5; 13.6-33.5	12.0; 7.0-48.3	16.0; 9.7-28.5	13.2; 7.8-19.4	12.9; 7.9-16.4	18.3; 8.3-29.1
Heterophil (%)	52; 38-77	52; 36-66	53; 36-75	53; 40-68	45; 24-61	43; 24-61
Lymphocyte (%)	40; 15-50	42; 30-59	45; 24-64	43; 28-49	50; 33-69	54; 35-76
Monocyte (%)	4; 1-8	5; 2-13	2; 0-6	4; 0-12	4; 1-11	3; 0-9
Eosinophil (%)	2; 0-4	2; 0-4	0; 0-1	1; 0-1	1; 0-2	0; 0-2
Basophil (%)	0; 0-1	1; 0-3	0; 0-1	1; 0-2	0; 0-1	0; 0
Total Protein (g/100mL)	3.4; 3.1-4.2	3.4; 2.9-4.5	3.5; 2.3-5.4	3.3; 3.0-3.6	3.4; 3.2-3.8	3.5; 3.0-4.0
Albumin (g/100mL)	<0.5	<0.5-0.5	<0.5	<0.5	<0.5-0.8	<0.5-0.5
Alkaline Phosphatase (IU/L)	179; 23-224	274; 186-372	331; 203-524	369; 230-538	391; 283-553	282; 327-510
Lactic Dehydrogenase (IU/L)	—	—	—	241; 204-288	271; 192-384	308; 293-322
Aspartate Amino-transferase (IU/L)	99; 88-110	262; 221-322	191; 143-263	144; 123-161	146; 118-160	151; 111-195
Glucose (mg/100mL)	—	—	228; 205-240	212; 178-251	241; 229-261	221; 204-237
Uric Acid (mg/100mL)	4.7; 3.7-6.9	5.5; 4.4-7.2	6.8; 6.4-8.3	7.6; 6.0-9.9	6.2; 4.8-9.3	5.4; 4.6-6.4
Gamma Glutamyl Transferase (IU/L)	—	—	—	2; 2-3	3; 2-3	3; 2-6
Creatinine (IU/L)	—	—	—	128; 62-252	144; 40-247	228; 140-290
Calcium (mg/100mL)	8.1; 6.0-10.6	6.9; 5.5-7.9	7.9; 6.8-8.8	8.0; 6.7-10.2	7.7; 5.7-9.9	8.9; 7.1-9.6
Phosphorus (mg/100mL)	—	—	5.8; 5.1-7.2	5.9; 4.5-8.1	6.1; 4.9-7.0	6.3; 5.7-7.0

AGE IN DAYS	41-43	48-50	55-57	62-64	69-76
Hematocrit (%)	29; 28-32	29; 28-31	28; 26-34	30; 28-34	34; 30-39
Red Blood Cell Count (10^6/mm^3)	1.30; 1.17-1.65	1.38; 1.19-1.62	1.34; 1.17-1.55	1.44; 1.29-1.73	1.57; 1.40-1.75
Mean corpuscular volume (MCV) (Fl)	211; 189-235	209; 191-223	210; 200-222	206; 196-223	214; 206-225
White Blood Cell Count (10^3/mm^3)	24.1; 14.5-32.8	23.6; 10.8-39.8	16.4; 10.8-23.9	14.7; 6.7-24.1	15.8; 5.6-20.4
Percent Heterophil	35; 20-61	42; 20-68	41; 21-64	40; 31-60	39; 18-49
Lymphocyte (%)	61; 38-77	56; 21-75	57; 31-73	60; 51-68	60; 49-83
Monocyte (%)	3; 2-5	4; 1-7	2; 1-6	3; 1-7	2; 1-3
Eosinophil (%)	0; 0-2	0; 0-1	0; 0	0; 0	0; 0
Basophil (%)	0; 0	0; 0	0; 0	0; 0	0; 0
Total Protein (g/100 mL)	3.0; 3.4-4.3	3.6; 3.3-3.8	3.7; 3.4-4.0	3.7; 3.1-4.1	3.8; 3.3-4.2
Albumin (g/100mL)	<0.5-0.6	<0.5-0.6	<0.5-0.5	<0.5-0.8	<0.5-0.8
Alkaline Phosphatase (IU/L)	449; 232-691	388; 286-529	399; 281-529	386; 271-616	288; 225-354
Lactic Dehydrogenase (IU/L)	239; 222-262	249; 194-292	285; 240-431	294; 192-499	324; 176-472
Aspartate Amino-transferase (IU/L)	159; 151-161	159; 110-184	152; 133-177	152; 119-182	173; 152-199
Glucose (mg/100mL)	228; 219-259	219; 214-233	214; 196-228	223; 197-254	212; 202-222
Uric Acid (mg/100mL)	6.1; 5.9-6.4	5.4; 4.7-8.1	5.2; 5.0-5.3	5.6; 4.8-8.4	6.4; 4.7-8.0
Gamma Glutamyl Transferase (IU/L)	3; 3	3; 2-5	2; 2-4	2; 2-4	2; 2-3
Creatinine (IU/L)	159; 128-191	168; 152-184	127; 92-169	172; 81-306	169; 71-337
Calcium (mg/100mL)	8.9; 6.1-9.3	8.0; 6.9-9.2	9.3; 8.2-10.2	8.9; 6.4-11.0	9.2; 7.1-10.9
Phosphorus (mg/100mL)	6.9; 5.9-7.9	6.5; 5.4-7.1	6.8; 6.0-7.7	6.8; 6.0-7.8	6.9; 6.0-7.8

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FEATURE: "UP FOR DISCUSSION"
IWRC *Journal of Wildlife Rehabilitation*

Wildlife rehabilitators discuss many topics in addition to those involved with the direct care and handling of wildlife, including professionalism, standards, ethics, wildlife policy, community involvement, and much more. The following case studies present hypothetical cases with fictitious names. If these fictional cases look familiar, it is because they were created based upon a composite of actual situations. They are not intended to represent any specific circumstance or person.

The objective of the case and published responses is to generate open dialogue among rehabilitators and others involved in the wildlife rehabilitation field on topics that could benefit from a broader and more public discussion. There is no single perspective or solution to these cases. Rather, the topics are "up for discussion." Some of the cases may also be discussed at upcoming IWRC conferences.

Each case is followed with several questions and responses from people involved in wildlife rehabilitation. Respondents were given the option to respond with or without using their names, but listing experience, position and general geographic region.

Due to space limits, we will not be able to use all responses that are received, nor in all cases, the complete responses from each contributor. We will make every attempt to include as many returns as we can, but even if your information is not used, we sincerely appreciate your participation in this project.

NOTE: ***The International Wildlife Rehabilitation Council (IWRC) makes no claims as to the accuracy or truth of the information contained in the following "Up for Discussion" cases, nor does it endorse any particular answer or response. They are fictional representations and all responses are printed as they are received from respondents, with the exception of being edited for available space and spelling errors. Any resemblance to actual current or past situations or persons, living or dead, are purely coincidental.***

UP FOR DISCUSSION: Case IV - "Limits"

This case deals with restrictions imposed upon a wildlife center by its Board of Directors limiting the species and numbers of animals that can be admitted for care, This decision was based upon criteria such as which animals would bring in the most donations; refusing all non-native species; and unilaterally euthanizing rabies vector species and "excess animals" in order to appease the local animal control agencies.

Respondents were asked to comment on how this would impact the center, the community, and the volunteers.

RESPONSES

This case history narrative clearly reveals that the GVWRC Board omitted the most elementary step before it set off down the risky path of radical policy change: problem definition.

Both problem definition and root cause analysis facilitate problem prioritization, as well as leading to sensible evaluation and prioritization of solutions. None of this crucial decision making sequence could have possibly been employed by the board, judging by the caliber of their so-called "solution".

The root cause of the center's problems was the increasing rate of patient intake. The most likely cause of this marked jump in growth is demographic - the progressive intrusion of urban sprawl. This being so, there is little or nothing immediate the GVWRC could have done about such a fundamental driving force. However, the board should have learned from it and leveraged off it.

First, increased population means increased wealth and, thus, increased funding opportunities. For the GVWRC, the inverse relationship occurred! Even the slightest brush with root cause analysis would have revealed the board's obvious culpability - a compelling enough reason for the board not to conduct

the analysis in the first place! Solution (in addition to throwing the board out on its ear): hire a proven fundraiser and enroll capable staff and volunteers into an expanded and rejuvenated campaign.

Second, the situation cries out for some meaningful planning. However, a board which is incapable of conducting even the simplest kind of problem solving exercise cannot be expected to plan beyond the truly moronic level. This adds considerable urgency to the necessity to replace the current board with one which can get the job done in a timely, professional and business-like manner.

Third, the time is right to make a change in operating management. The case history strongly indicates that the Executive Director is simply not up to the task occasioned by increasing demand. Releasing her from the daily routine and bringing in an experienced operations manager will result in numerous improvements - efficiencies and synergies which will not only eliminate the operating problems currently plaguing the GVWRC, but will also allow it to handle a greater volume with the same resource base.

Even under the most forgiving of circumstances, the board's decision REMAINS INDELIBLY WRONG. The reason is that the center was initially set up without qualifiers to rehabilitate wildlife; community expectations were raised and met. With time, these origins have become the center's heritage and its mission, so that the GVWRC now has a binding moral obligation to give the community what it needs and what it rightfully has come to expect. Only a higher moral argument can justify reducing services and narrowing the focus.

Tragically, the GVWRC's hypothetical fall from grace is destined to be played out in the real world wherever sprawl-catalyzed growth occurs. Many rehabilitation organizations which start out successfully as small, happy bunches of volunteers will be incapable of making the necessary transitions when demands inevitably escalate. Those in charge (the "staffs" of retread volunteers, boards of societal conscious individuals who don't know a Titmouse from a Deer Mouse) will refuse to acknowledge the need for, and benefit of, an injection of professional management and knowledgeable board membership.

As a result, institutions trapped in this position will cut back their services to levels that their existing, limited management capacity can tolerate. This reduction is, of course, occurring precisely when burgeoning urban wildlife needs more help, not less! But those who make these self-serving decisions will not recognize their impact on the wildlife, let alone on the public.

To maximize the changes of wildlife survival against man's depredations requires maximum public involvement. Curtailing rehabilitation and discriminating against certain species is not a role model calculated to inspire the necessary care, compassion and concern in the public. And, if this were not enough, the very existence of this type of dilettante rehabilitation also drags down the moral standing and reputation of the whole wildlife rehabilitation community. Within this community, a permissive attitude toward these devastating actions and mindsets raised the inevitable question: "The buck stops.....where?"

Christopher Panton, Ph.D.
Danville, California
Retired Business Manager

Our position places us first in line at the defense of wildlife. Commonly, we are first to become aware of trends in populations. Because of this critical role, we must familiarize ourselves with our whole ecosystem on a large scale.

After considering all the facts about the whole population over time, we can better understand and work within this seemingly chaotic natural system. Knowledge of the facts allows us to identify our options and weigh their advantages and disadvantages.

Clearly, a majority supports the Endangered Species Act. Doesn't this advocate that we recognize some species over others? The law's premise and main reason for success is the identification of certain species, those that do deserve special consideration over other species that are thriv-

ing. And so, if non-native species, such as English Sparrows, are thriving while our own native sparrows and other songbirds decline by 30-60 %, is it counterproductive to treat and release non-natives which will compete for nesting sites, food, or even outright kill young natives?

As wildlife professionals it is our responsibility to investigate all aspects including the long-term impacts of the animals we treat and release. Are we artificially supporting and/or increasing a certain species numbers at the detriment of another? Is it part of a natural cycle when a large portion of one years offspring dies off? Are an endless supply of uncapped garbage cans, or the lack of a natural predator, producing artificially high numbers of young that will eventually become candidates for starvation and disease?

When population trends indicate that an area has reached its carrying capacity and that the individuals are bordering on disasters such as starvation, disease, or becoming a nuisance, we need to accept that management burden and do what we can to avoid undue suffering and attempt to improve things. In some cases this may mean establishing limits. Although this is tremendously difficult, it would be unfair, even wrong, for us to turn our backs and pretend that those aspects of wildlife work are not ours too.

More often than not, we find ourselves reacting to the 500 raccoons that come through our doors each year, and not becoming proactive and planning ahead so that we can provide for those much more rare species, those that are facing extinction and desperately need our support and protection.

Striving toward supporting a good balance, with high diversity, is what will give our natural system the greatest rewards in the long run. This means that our decisions to accept or limit species should not be driven by those we see in high numbers each year, but balances against our ability to care for, and be concerned with, those whose numbers are declining. This means reviewing our policies regularly to reflect changes in population trends over time. This is one of the challenges we should rise toward, not turn our backs on.

If rehabilitated wildlife is a nuisance to any community, interspecific or intraspecific, wildlife and/or human, then what is gained in laying blame? Better to review our preparation for each release. Asking if practice or policy is suffering from a lack of proper site selection, prevention and consideration of imprinting, avoidance training, exposure to opportunities to forage for, and to be introduced to naturally occurring local food sources, etc. All of these and more need to be incorporated when an individual is being prepared for release. In addition to those elements, attention needs to be given to certain local situations to make a release successful.

The Board of Directors' focus on the bottom line may seem harsh, but it is absolutely essential that some one or group address those real issues and needs. Having the fiscal fortitude to be able to allow the rehabber to plug in a heating pad and have it warm a patient are analogous with a bottom line. The board's greatest error may be in not realizing that if presented well, not only charismatic mega-fauna will hold the endearing fascination of the public, but that some of the most intriguing, successful animals on the globe today will fit on the tip of the human finger, as is revealed in the fascinating and complex social structure, one aspect of which is exhibited by the divinely delicate dance displayed by Honey bees.

Amy K. Maehler, Executive Director
Central Wisconsin Wildlife Center

Readers are invited to submit their views on the case, discussing issues they see, and offering ideas and suggestions regarding the situation. Several responses will be chosen for publication in the next issue of the journal. If you have a hypothetical case that you would like to submit for discussion, send it to IWRC, attention "UFD".

After you have read the case, think about the questions posed at the end of the article or any other issues that come to mind. Talk about them with other rehabilitators, and, if you choose, share your thoughts with us. Deadline for next Journal publication: September 18, 1998.

Next Topic - UP FOR DISCUSSION: Case V - "A Question of Ethics and Resources"

The "Up For Discussion" scenario for this quarter is a variation of those we have published in the past. Rather than a hypothetical question this problem is real, presented by an active wildlife rehabilitator like yourself that is looking for some real answers.

I specialize in reptiles and amphibians. I have not turned away any animal I had space for since I started doing this. I have had to turn away some very large snakes and Monitors due to lack of proper facilities for them.

As time has passed, I have noted that the bulk of the exotics I get are of the following types: Giant Snakes (Burmese and Reticulated Pythons, etc.) Giant Lizards (Iguanas, Monitors, etc.)

Some of these animals are endangered in their native countries, others are 'food animals' there, but most of the ones I get are pretty obviously captive bred (CB). In my opinion and observation, the large animals have the following characteristics:

#1 I don't see most of them as being suitable for pets for **most** people. They are dangerous (Burmese, Retics, large Monitors) or difficult to keep properly (iguanas, tegus), if not both.
#2 The pet trade is unloading most of these animals at heartbreaking prices ($7-$12 for iguanas, $50 for Burms) and thus many people are picking them up as "disposable" pets.
#3 When I see them they are nearly always ill, many are abused and some are so far gone that even breakneck efforts involving hundreds of dollars in vet bills per animal and many individual hours of care will not bring them back from the edge.
#4 As 'giant' animals they require specific (and very expensive) habitats compared to most native species. Without properly secured habitats, both my community and I are at risk from these animals.

During the course of a year I can only spend so much money on animals, since most of it is 'out of pocket' (try getting people to donate money for these 'slimy' creatures!). I improve my facility every year, but I only have so much to do it with. I would like to add a hibernaculum this year for turtles, but probably won't because my exotics' vet bills clobbered my improvement budget (it's gone).

I want to help any of these animals I can, but I feel as though I can't keep on dealing with abandoned pet iguanas and burms for a number of reasons:

#1 They are proliferating at a huge pace (both CB and wild-caught). More and more unqualified people are buying them, and then people like myself and the local shelters are being asked to pick up the slack when the animals prove unruly, dangerous or simply 'too much to deal with' for their owners.
#2 I have limited resources and I would prefer to give better care rather 'more' care where it is possible.
#3 I have a 'no kill' policy. Once an animal is in my doors, I am committed to fighting whatever is wrong with it until such time as the vet tells me there is no hope. I can't see changing this.
#4 There are only so many cooperators out there with facilities for these guys. One of my best ran out of room this year - she has no more space. I have one contact left to take the big guys off my hands when I get them healed up enough to set them up for adoption. No one appears willing to take iguanas at this point.
#5 I don't want to burn out spending time trying to get these guys adopted after spending months getting them healthy. I **can't** put them back into the same sort of scenarios I got them out of. Adoptions take a lot of time and effort away from caring for sick animals.
#6 I am getting more and more non-releasable natives. They are healthy but have been kept as pets or exposed to CB exotics or their habitat has been destroyed. These need long-term homes.

Possible Questions for Discussion

This is where I stand these days.
- Do I simply stop taking in these guys - risking my relationship with cooperating agencies and facilities?
- Should I set limits?
- Should I look toward euthanasia as a solution?
- Should I sacrifice top-notch care for natives and smaller exotics to simply "cover all the bases"?
- Am I indirectly supporting further sales and importation of large, dramatic and dangerous animals through my activities?

This isn't a complete list of everything I have thought about with this issue, but it covers the major points. I would value your opinions.

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A Closer Look at Rehabilitation Permit Conditions

Marlys J. Bulander, Permit Administrator
US Fish & Wildlife Service
Region 3

The seven U.S. Fish and Wildlife Service (Service) Regional Permit Administrators have worked closely with veterinarians, State Game Departments, rehabilitation organizations, and individual rehabilitators throughout the United States.

We have listened to many ideas, plans, complaints about regional differences, and concerns over the inadequate regulations governing who and how people can rehabilitate animals. Based on your concerns, we decided it was time to make some changes. Some of those changes included new permit applications, revised information sheets, and consistent permit conditions for rehabilitators. It was not an easy process. In making changes we tried to think through the implications these changes could cause. We feel we have made a positive start. We appreciate all the advice and help that many of you have given us.

Unfortunately there are still some rumors, confusion, and speculation of what will happen to rehabilitation based on these changes in the issuance and/or renewal of Rehabilitation Permits. Please keep in mind that we are willing to listen to your concerns, we are also willing to clarify and explain why some changes had to be made. Please feel free to contact the IWRC office in writing if you have questions or concerns.

In addition to the following copy of all the rehabilitation regulations, I would like to address some specific issues and hopefully clarify our intent on permit conditions that may still be misunderstood.

•Condition 3: You need an applicable state license to rehabilitate and you have to be in compliance with other local regulations such as zone restrictions, etc.

•Condition 6: The primary goal is to rehabilitate migratory birds and return them to their wild populations as quickly as possible. Ninety days is usually more than enough. However, if that recovery period needs to be extended, it is a simple matter of advising the appropriate regional office with a note, proposed treatment and expected release date. Denial of such requests are rare. Please keep in mind that this request should be sent to the appropriate regional office close to the end of the first 90 day limit.

•Condition 7: Caging requirement - the simple answer is that the FWS is using the " IWRC/NWRA Minimum Standards for Wildlife Rehabilitation" ONLY AS A GUIDE to assist the Service in evaluating your facilities by identifying what cage sizes would be ideal for specific species and what kind of material should be used in order to be bird friendly. Bureaucrats need to seek advice from the experts in the field from time to time. We are not professional rehabilitators, and we need to place our trust in organizations such as the IWRC and NWRA to give us information/guidelines that we can use to evaluate facilities and to insure that the high standards that you have set for yourselves are protected and respected. I know that this has been repeated many times, but we are using these standards as a tool, as they give us the ability to tell someone who is using inappropriate material, i.e. cardboard boxes for permanent cages, that rehabilitation permit conditions require something better.

One hundred foot flight cages are not mandatory in order to rehabilitate raptors and the Service does not have an opinion on the merits of using flight cages vs. creance flying. Pre-release protocol is a commonsense issue. It should insure that birds have the ability to sustain extended flights, recognize their food, be able to hunt, have foraging skills, predator recognition, and social conditioning. Preparing a bird for release may require TEAMWORK with other rehabilitators who have flight cages or creance experience.

•Condition 8: Our research on this subject included talking to veterinarians, rehabilitators, reading articles, including material from IWRC and NWRA, and hours of discussion. For 99% of you, this condition will not change your current procedures. However, it will provide you with support from FWS in defending your decision to euthanize animals that cannot recover and be released back into the wild. Again keep in mind that this permit condition states that animals that have certain injuries should be euthanized. In some circumstances, some of these nonreleasable birds could be used in educational programs, and they will be dealt with on a case by case basis. This condition does not affect your current birds held under educational permits.

Each and every one of you plays an important part in rehabilitation, from backyards to established centers, and these permit conditions were designed to enable all of you to continue to succeed. I hope we can keep an open line of communication as we work through these changes. Please let us know what needs to be updated and identify the areas that may still cause confusion. Provide us with an opportunity to continue to clarify our position, but most of all give the process a chance because the intent is to assist not hinder your rehabilitation efforts and expectations of rehabilitation.

Standard Conditions
Special Purpose - Possession/Education (Live Specimen)
50 CFR 21.27

1. Permittee, and sub-permittees, shall carry and display, upon request, a copy of this permit whenever exercising its authority.
2. Failure to comply with **ANY** of these conditions listed may result in the immediate suspension of this permit.
3. Authorization granted herein shall not be exercised contrary to the laws of the appropriate State, County, Municipal, Tribal, or Foreign government or any other applicable laws.
4. Permittee shall maintain records as required in 50 CFR 13.46 and 50 CFR 21.27.
5. All required records relating to permitted activities shall be kept at the location as indicated
6. The death or escape of any birds must be reported in writing within 48 hours to the issuing office. Birds possessed under this authority may not be used for breeding purposes.

If the permittee is requesting to **acquire** a bird, the request must include the following:

- Identify the species that you are requesting;
- A veterinarian's statement as to why the bird is nonreleasable;
- A brief outline of the presentation involving each additional species;
- A description of permanent facilities where the species will be housed;
- A description of your experience in handling the species being requested, if different from birds currently listed on your permit;
- A copy of any additional state authorization if applicable;
- Provide information regarding the person/institution who is transferring the bird to your facility including their name, address, and permit number.

If the permittee is requesting to **transfer** a bird, the written request must include the following:

- Identify the specifies of bird the permittee is proposing to transfer;
- Provide the name of the person/institution who is requesting the bird, their address, and federal permit number;
- Provide a veterinarian's statement as to why the bird is nonreleasable.

7. Migratory birds possessed or transported under authority of this permit **MAY NOT** be displayed in any manner which may imply personal use by the permittee nor representation, promotion or endorsement of any products, merchandise, goods, services or any business, company or corporation or other organizations except the permittee's educational activities or the U.S. Fish and Wildlife Services.
8. The intent of this permit is wildlife conservation education. A minimum of 12 programs per bird should be presented each year. The authority to possess migratory birds will be subject to reevaluation if this condition is not met.
9. The birds listed on this permit remain in the stewardship of the U.S. Fish and Wildlife Service and may be recalled at any time.
10. Display of any migratory birds, nests, eggs, or any parts thereof under authority of this permit shall be accompanied by a sign indicating possession and exhibition by permission of the U.S. Fish and Wildlife Service.
11. All facilities and equipment must be adequate for each species the permittee plans to possess for educational programs. Criteria used for evaluating and inspecting permittee's facilities for housing raptors will be based on the guidelines established by The Raptor Center, University of Minnesota publication "Care and Management of Captive Raptors". All other live birds held under this permit must be maintained under humane and healthful conditions as required in 50 CFR 13.
12. These birds must be kept under control at all times and are not allowed to come into contact with members of the audience unless otherwise authorized.
13. Permittee assumes responsibility for damage or injury to any person or property occasioned through the possession or handling of migratory birds and the United States Government shall be indemnified and saved harmless against claims for damage or injury in such cases.
14. Acceptance of this permit authorizes inspection in accordance with 50 CFR 13.47.

SPPS_L.CON 14.7 4/98

Standard Conditions
Special Purpose Possession/Education (Dead Specimen)
50 CFR 21.27

1. Permittee, and sub-permittees, shall carry and display, upon request, a copy of this permit whenever exercising its authority.
2. Failure to comply with **ANY** of these conditions listed may result in the immediate suspension of this permit.
3. Authorization granted herein shall not be exercised contrary to the laws of the appropriate State, County, Municipal, Tribal, or Foreign government or any other applicable laws.
4. Permittee shall maintain records as required in 50 CFR 13.46 and 50 CFR 21.27.
5. All required records relating to permitted activities shall be kept at the location as indicated writing by permittee to the issuing office.
6. Permittee is responsible for all specimens and/or parts that you have acquired. Any unused migratory bird carcasses that are sent to a taxidermist must be returned to the designated repository for final disposition. Carcasses unsuitable for donation shall be completely destroyed by burial or incineration. Excess suitable carcasses may be disposed of by donation only to a public museum, scientific or educational institution with written notification to the issuing office, or as directed by the issuing office.
7. Permittee shall report any loss or damage of specimens to issuing office immediately in writing.
8. This permit **DOES NOT** authorize the acquisition, transfer, trade, replacement or removal of any specimen without written approval from the issuing office.
9. Migratory birds possessed or transported under authority of this permit **MAY NOT** be displayed in any manner which may imply personal use by the permittee nor representation, promotion or endorsement of any products, merchandise, goods or services or any business, company, corporation or other organizations except the permittee's educational activities or the U.S. Fish and Wildlife Service.
10. The intent of this permit is wildlife conservation education. A minimum of 12 programs per bird should be presented each year. The authority to possess migratory birds will be subject to reevaluation if this condition is not met.
11. The birds, nests, eggs, and any portions under authority of this permit remain in the stewardship of the U. S. Fish and Wildlife Service and may be recalled at any time.
12. Display of any mounted migratory birds, parts, nests or eggs, under authority of this permit shall be accompanied by a sign indicating possession and exhibition by permission of the U.S. Fish and Wildlife Service.
13. Acceptance of this permit authorizes inspection in accordance with 50 CFR 13.47

SPPS_D.CON 14.11 4/98

Standard Conditions
Special Purpose - Salvage
50 CFR 21.27

1. Permittee, and sub-permittees, shall carry and display, upon request, a copy of this permit whenever exercising its authority.
2. Failure to comply with **ANY** of these conditions listed may result in the immediate suspension of this permit.

3. Authorization granted herein shall not be exercised contrary to the laws of the appropriate State, County, Municipal, Tribal, or Foreign government or any other applicable laws.
4. Permittee shall maintain records as required in 50 CFR 13.46 and 50 CFR 21.27.
5. All records relating to permitted activities shall be kept at the location as indicated in writing by permittee to the issuing office.
6. Carcasses unsuitable for donation shall be completely destroyed by burial or incineration.
7. The permit **DOES NOT** authorize the salvage of specimens on Federal lands without additional written authorization from the applicable Federal agency.
This permit **DOES NOT** authorize salvage of specimens on State lands or other public or private property without written permission or permits from landowner or custodian.
8. Within 48 hours report to the issuing office if any threatened or endangered species, as listed in 50 CFR 17, and/or bald or golden eagles have been salvaged.
9. Immediately report any carcasses found in a situation indicating poisoning or criminal activity. These should not be salvaged, but reported immediately to State and Federal Wildlife Law Enforcement authorities.
10. Each bird salvaged shall be tagged by the permittee. Each tag shall have the following information.
(a) date and location specimen was salvaged
(b) name of person who salvaged the specimen
(c) the permit number under which the specimen was salvaged.
11. All birds salvaged under this authorization must be deposited with the designated repository as indicated on the face of this permit within six (6) months of acquisition. Any unused migratory bird carcasses that are sent to a taxidermist must be returned to the designated repository for final disposition. All birds salvaged during any calendar year must be deposited with the repository by December 31 of that calendar year. **This permit does not allow personal possession of any birds salvaged** under authority of this permit.
12. Acceptance of this permit authorizes inspection in accordance with 50 CFR 13.47.

SPSL.CON 12.5 4/98

Standard Conditions
Scientific Collecting
50 CFR 21.23

1. Permittee, and sub-permittees, shall carry and display, upon request, a copy of this permit whenever exercising its authority.
2. Failure to comply with **ANY** of these conditions listed may result in the immediate suspension of this permit. All requirements of 50 CFR 21.23 apply.
3. Authorization granted herein shall not be exercised contrary to the laws of the appropriate State, County, Municipal, Tribal, or Foreign government or any other applicable laws.
4. Permittee shall maintain records as required in 50 CFR 13.46 and 50 CFR 21.23(c)(4).
5. All required records relating to permitted activities shall be kept at the location as indicated in writing by permittee to the issuing office.
6. Live birds taken and retained alive must be released at the capture site unless otherwise authorized on the face of the permit.
7.Dead birds, or any parts thereof, (except bald and golden eagles, endangered and/or threatened species), shall be promptly destroyed by burial or incineration if they are unsuitable for donation. All suitable carcasses or parts thereof, may be disposed of by donation to a public museum, scientific or

educational institution as defined in 50 CFR 10.12, for exhibit, scientific or educational purposes, or as directed by the issuing office.
8. This permit **DOES NOT** authorize the take or release of specimens on Federal or State lands or other public or private property without additional written authorization, permission, or permits from the applicable Federal or State agency, landowner, or custodian.
9. This permit **DOES NOT** authorize the take or live trap and release of bald or golden eagles and/or federally listed threatened or endangered species.
10. Nontoxic shot must be utilized when authorized collecting of migratory birds is done with a shotgun unless otherwise noted on the face of the permit.
11. Unless otherwise authorized on this permit, all migratory game birds taken during open hunting season must be in compliance with all applicable Federal and State hunting regulations.
12. Each bird collected and/or salvaged shall be tagged by the permittee. Each tag shall have the following information: (a) date and location specimen was collected, (b) name of person who collected the specimen, and (c) the permit number under which the specimen was collected.
13. The annual report may contain copies of final reports, publications, etc. on the findings that result from the project.
14. If salvage activities are authorized, endangered/threatened species, bald and/or golden eagles must be reported to the issuing office within 48 hours.
15. Acceptance of this permit authorizes inspection in accordance with 50 CFR 13.47.

SCCL.CON 8.5 4/98

Standard Conditions
Special Purpose - Rehabilitation
50 CFR 21.27

1. Permittee, and sub-permittees, shall carry and display, upon request, a copy of this permit whenever exercising its authority.
2. Failure to comply with **ANY** of these conditions listed may result in the immediate suspension of this permit.
3. Authorization granted herein shall not be exercised contrary to the laws of the appropriate State, County, Municipal, Tribal, or Foreign government or any other applicable laws.
4. Permittee shall maintain records as required in 50 CFR 13.46 and 50 CFR 21.27.
5. All required records relating to permitted activities shall be kept at the location as indicated in writing by permittee to the issuing office.
6. Birds **MAY NOT** be held for more than 90 days unless a written notification is submitted to the issuing office identifying the species, existing problem, proposed treatment and expected release dates. The permittee's rehabilitation permit does not authorize the permittee to hold nonreleasable birds for the sole purpose of placing them in educational programs.
7. Facilities must be adequate for each species the permittee plans to rehabilitate. Criteria used for evaluating and inspecting permittee's facilities will be based on the International Wildlife Rehabilitation Council's and the National Wildlife Rehabilitators Association's "Minimum Standards for Wildlife Rehabilitation".
Permittee may transfer migratory birds to other qualified rehabilitation permittees for care. All birds that recuperate must be released to the wild in an appropriate habitat for the species. Before any birds can be released, it is strongly recommended that the permittee cooperate with local State and Wildlife Agencies in identifying appropriate release sites.

Every precaution must be taken to avoid imprinting birds in permittee's care to humans. Except as required for the care provider to feed, water, and exercise animals, indoor and outdoor facilities, cages, pens, enclosures, or other areas must be sufficiently separate and protected from pets and from human living or work space to prevent human contact with animals. Animals must be kept in separate facilities at all times except when removal is necessary for veterinary care, transfer or another licensed rehabilitator, or release to the wild. Permittee will be required to transfer any imprinted birds as directed by the issuing office. Under no circumstances will any permittee be able to keep a bird that has been imprinted while under their care.

8. Any birds that have sustained injuries requiring amputation of a wing at the elbow (humero-ulnar joint) or above, a leg or a foot, and/or are blind should be euthanized. Permittee should not sustain the life of any migratory bird that cannot after medical management feed itself, or has an impairment that prevents it from perching upright, or cannot ambulate without inflicting additional injuries to itself. Permittee must contact the issuing office prior to euthanizing bald and golden eagles, endangered species or threatened species.
9. This permit **DOES NOT** authorize the use of injured/recovering migratory birds for educational purposes. Birds shall not be displayed to the public unless the permittee is using video equipment or barriers that will prevent birds from both hearing and seeing the public. If at any time a device that allows the public to view birds causes stress or harm, or impedes the rehabilitation of any bird, it must be discontinued immediately.
10. Immediately report to U.S. Fish and Wildlife Service Law Enforcement **AND** within 48 hours report to the issuing office **ANY** birds (dead or alive) that are acquired that indicate suspected poisoning or other criminal activity.
11. Within 48 hours report to the issuing office any (dead or alive) threatened or endangered species, as listed in Title 50 Code of Federal Regulations, Part 17, and/or bald or golden eagles. The issuing office will determine disposition of all eagles, threatened and endangered species.
12. Live birds, except bald and golden eagles, endangered and/or threatened species, which are suitable for use in educational programs or research projects can be placed with a qualified public educational or scientific institution as defined in 50 10.12. No birds may be transferred unless prior approval has been authorized by the issuing office.
13. Dead birds, or any parts thereof, (except bald and golden eagles, endangered and/or threatened species), shall be promptly destroyed by burial or incineration, or donated to public institutions, as specified in 50 CFR 10.12, or transferred, with permission from the issuing office, to individuals authorized to possess migratory bird specimens for education purposes.
14. This permit **DOES NOT** authorize any necropsy to be performed on any eagles or threatened or endangered species without prior approval from the issuing office.
15. Permittee may possess a limited number of feathers (excluding eagle feathers) for imping purposes only.
16. After appropriate notification to the issuing office (see conditions 10 and 11), eagle feathers and/or whole eagle carcasses may be maintained until such time that they can be shipped to the repository. Contact: **U. S. Fish and Wildlife Service, National Eagle and Wildlife Repository, Rocky Mountain Arsenal, Building 619, Commerce City, Colorado 80022, (303) 287-2110.**
All dead birds and/or feathers regardless of species, except what is authorized by condition 15, cannot be held for more than 180 days without additional authorization from the issuing office.
17. All birds possessed under this permit remain in the stewardship of the U.S. Fish and Wildlife Service and may be recalled at any time.
18. In the event the permittee receives a U.S. Fish and Wildlife Service banded bird, the band number should be reported to the **Bird Banding Laboratory at 1-800-327-2263.**
19. Acceptance of this permit authorizes inspection in accordance with 50 CFR 13.47.

Editor's Note: IWRC has invited all of the USFWS regional licensing agents to participate in an open discussion group regarding these conditions, at the Fort Worth conference.

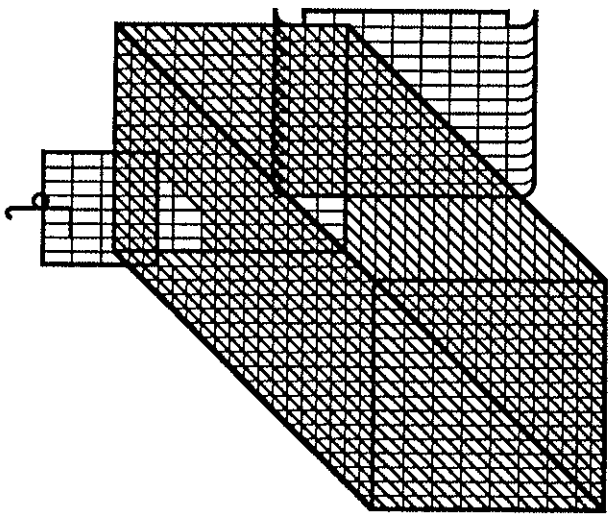
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Simple Things That Make a Difference: Design and Plans for a Juvenile Squirrel Cage

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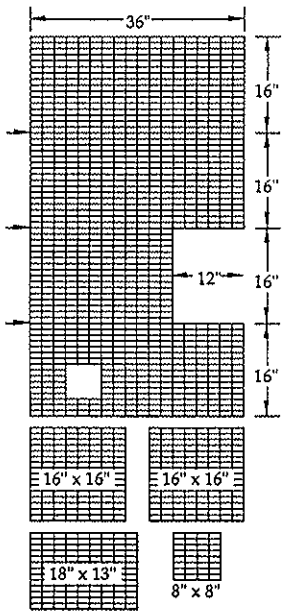
After struggling with commercially built cages available in pet stores and through mail order catalogs that did not suit our specific needs, we now design and build our own indoor cages for tree squirrels (juveniles and recovering injured adults). The dimensions of the cages, door size and placement, and wire size varies depending on needs of the animal. This basic cage is easy to build and generally takes less than two hours (after materials are on site). The materials (wire, J-clips, spring latches, and locks) are available at local hardware stores or mail order and generally cost less than $20. The tools are extra, but are a one time expense.

An example of a cage designed specifically for juvenile aged (pre-weaned) tree squirrels (except for Pine Squirrels) follows. The overall dimensions of the cage are 36" (length) by 16" (height). The cage weighs approximately 6 pounds. The cage has two doors, one at each end. The large door allows for an opening big enough (12" x 16") to facilitate cleaning, as well as placement and removal of a nesting box or hammock and small tree limbs or other natural habitat material. The small door provides an easily controlled opening (6" x 6") to prevent escapes while taking out one squirrel at a time for feeding.



The primary materials required are 8 feet of 36" wide 1" x 2" galvanized 14 gauge welded wire and J-clips. Tools needed include a wire cutter, J-clip pliers (to crimp J-clips); either a bench grinder, grinding wheel for an electric drill, or manual flat file to smooth rough edges; and a pair of J-clip removal pliers or regular pliers. Additional materials include a spring lock for the small door; 2-3 snaps or locks for the large door; a fresh water source (such as an 8 oz. water bottle or shallow dish) and a nesthammock.

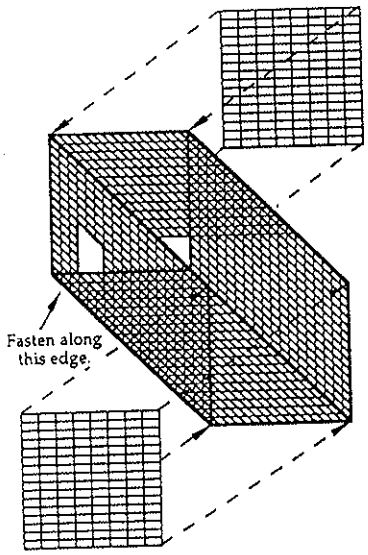
The following diagram shows where to cut the wire, including the large and small openings for the doors. Be very careful with the sharp edges of the newly cut wire. Gloves and safety glasses are always recommended. Once all of the wire is cut, the sharp edges need to be filed down until they are smooth. This is a tedious job, but reduces later scratches on animals and rehabilitators.



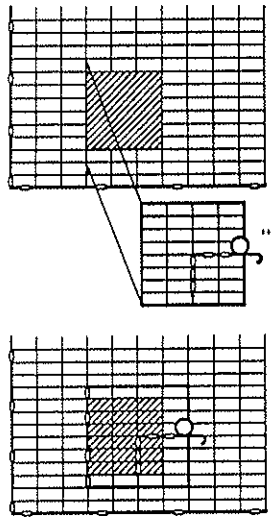
Once the edges are smooth, fold the 64" long piece of wire at 16" intervals, as shown by the arrows in the cutting diagram. Try to get the folds as close to a 90 degree angle as possible. Then fasten the two ends together just below the small door opening with J-clips, as shown

below. Space the J-clips about every 5-6 inches. While the cage is still pliable at this point, bend the wire with your hands to "square-off" all of the sides, removing any wavy areas. Next, attach the two end pieces as shown with J-clips.

The last assembly steps involve attaching the two doors. The small door uses a spring lock to hold the door closed. The lock attaches to the 8" x 8" piece of wire with J-clips. Then, the door itself is attached to the cage as shown, with J-clips serving as hinges. Use 4-5 J-clips for the hinges. Once attached, the door should overlap the opening by 1" on the top and bottom, and by 2" on the side with the spring lock. The large door is made be taking the 13" x 18" piece of wire and notching the upper corners. Then the upper edge and the two side edges are bent over in order to form a lip on the door, to prevent escapes when the door is closed. Snaps or locks are then used to hold large door firmly in place.

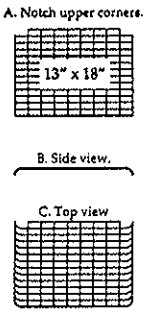


The bottom of the cage can be lined with newspaper and covered by a cut to fit piece of stiff Astroturf (use the product with the stiff jute backing). The Astroturf prevents access to the newspaper, and allows urine to soak through to the paper. The Astroturf cleans up nicely after soaking in hot water and a germicide, rinsed and then hung out in the sunlight for a day or two. For juvenile squirrels, a nesting box made from wood can be placed inside the cage, or a cloth hammock made from a T-shirt or flannel can be hung down from the top of the cage, with the four corners of the cloth tied to the top of the cage. A water bottle can be hung on the outside of the cage, with a metal nipple fitting through the wire to the inside. (A piece of 1/4" hardware cloth placed between the water bottle and the outside wall of the cage will prevent chewing through the plastic bottle.) Small branches can be added for chewing and to develop climbing skills. The cage can be easily totally or partially covered with a blanket or cloth bed sheet to provide a visual barrier to reduce stress (especially helpful if the cage is used for transport into a release site).



This cage is not recommended for unattended outdoor use, as the 1" x 2" size wire will not prevent entry from certain predators. It is best used in an indoor facility. The cage can be constructed with other size wire, such as 1" x 1", but will lose overall structural strength if wire smaller than 14 gauge is used (1/2" x 1" is acceptable for Pine or large ground squirrels but not for juvenile tree squirrels since it can injure feet and legs).

This cage is relatively quick and easy to build and should fit within most budgets. It is also an excellent way to learn how to use J-clips to build small mammal caging.



Some sources for materials include the following:

Bass Equipment Company, PO. Box 352, Monett, MO 65708 (1-800-798-0150). The heavy duty J-clip pliers provide a tight crimp ($12). J-clips are about $3 per pound and the spring door locks are $.65 each. The J-clip remover pliers are $20, but worth every penny if you build cages on a regular basis.

Da-Mar's Equipment Company, 14468 Industrial Parkway, South Beloit, IL 61080 (1-800-95BUNNY). Excellent catalog of supplies. They also carry J-clip pliers, J-clips, water bottles and other caging supplies. Extensive selection of welded wire sizes, gauges, galvanized either before or after welding, and even vinyl coated wire. (The local hardware store is probably the most economical source for the wire, but make sure the wire is straight and has a good galvanized finish. Otherwise, look elsewhere.

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HELPFUL HINTS FOR THE REHABBER

Keeping Cool

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Drawings by Marge Gibson

On hot summer days and stifling nights there are a few simple things rehabilitators can do to make the lives of animals in care more pleasant. A basic fact: ice can be appreciated by all.

Fill empty bottles and jars (preferably glass ones) between 1/2 and 2/3 full of water, then freeze them. Leave the top off, or only very loosely screwed on, while in the freezer. Remember, water expands when it freezes and if the top is on tight at this stage, the bottle may explode (normally the bottom will crack). Once frozen, the tops should be screwed on tight and the bottles placed in an animal's cage. I have used this method with rodent colonies. Once I put the frozen jars into the cages, rats will rush to drape themselves over the cold bottles. Other mammals would likely appreciate the same advantage. Glass is preferable because most rodents will chew on the bottles. This can be dangerous as well as create quite a mess; a hole in a plastic bottle filled with water only leaves you with a soggy cage to clean. Many other mammals would likely appreciate such icy relief.

Another cooling touch on hot summer days is ice added to water bowls and baths. Ice cubes are adequate, but blocks of ice will last longer. You can make ice blocks by rinsing out paper milk and juice cartons, filling them with water (again only 1/2 to 2/3 full), and then freezing. You can then either use them intact, or peel the paper off leaving just the raw ice. Raccoons, fox and bobcats have all shown an appreciation for blocks of ice in their water pans.

Finally, for outdoor aviaries or pens, a fine mist of water from a garden hose or misting system can be a source of relief. Spraying animals with a fine spray will provide temporary relief. Simple misting systems can be purchased from greenhouse supply houses if you want to set up a more permanent cooling system. Most birds and many mammals would appreciate this occasional cool shower.

Animals respond well to a fine mist **next** to them. At first, if desired they will generally step into the mist. If they don't, aim for mid-body and try to avoid direct contact with the face. This should be both a refreshing and **positive** experience.

Note: Be sure not to 'power hose' animals. In an automatic misting situation, be sure to allow animals an area that is dry also. Body temperatures can drop quickly.

Editorial continued from page 2

and printing, we strive to keep these increases to a minimum. The IWRC is currently exploring the area of grants and donations as a support base for the development of programs, and will continue to explore these avenues.

With our entry into the next century and the next millenium, we will continue to expand and update our programs, training, networking, and our outreach to other countries and cultures. The board and staff of the IWRC are excited about the future and we invite all of you to be a part of it.

So, where DO we go from here? This question is posed to you, our membership. Let us know what your needs are. Where do you see the IWRC in the next century? What are the needs of wildlife rehabilitators now and in the future? Contribute in any way that you can, whether it is by way of submitting articles for publication, sharing information and data, reports on case studies and research, making financial donations or referrals, or simply by saying "Good job," occasionally. The future is now and it is in your hands. Support your organization and support each other. Participate in the future, yours and that of the International Wildlife Rehabilitation Council!

-Mary Reynolds-

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Putting Baby Back

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ABSTRACT

Every spring rehabilitation centers are filled with young birds of every species and description. One of the easiest and most successful methods to deal with these is to put them back into the wild either with their own parents or with foster parents of the same species. The following article outlines methods to do this.

This solution not only eases the stress on the rehabilitation center during "baby season", but more importantly gives the youngsters a better chance when reared by an adult of its own species in natural habitat. While artificial rehabilitation methods can be successful with young birds, rehabilitators can never be as successful at rearing them as are the natural parents.

The ethics of replacement of rejected young and natural mortality will be discussed.

Key Words: avian rehabilitation, return to nest, foster-parenting, cross-fostering, avian scent, myths, natural mortality

Introduction

Thousands of juvenile wild birds are taken to wildlife rehabilitation centers annually. In many cases rescue and rehabilitation is not necessary since the wild birds can be successfully returned to their nest or territory where parents will feed and nurture them.

Ideally with newly fledged or healthy young of avian species the best solution is to replace the young in the same nest or territory from which they came. If this is not possible due to destruction of the original nest, a replacement nest might be created nearby. As a third choice the young may be fostered into a wild nest of the same species with chicks of similar age and stage of development. Keep in mind that if fostering is done; it is imperative not to overburden the foster parents if they already have a large brood. This practice may result in death of the natural young as well as the fostered ones. The well being of the natural brood must be considered first. If adding more may create an overburdened parent, DO NOT DO IT! This is an important ethical consideration.

Myth vs. Fact

First, the myth concerning the handling of wild birds must be examined. The myth is as follows: if a human touches a young bird, the parent will no longer accept it. While the origin for this idea is uncertain, it denies the reality of wild bird behavior. One source suggests it may have begun with early naturalists. Those that visited birds' nests to view the young returned to find them gone. Perhaps in present day interpretation we would suspect that predators follow the human scent back to the nest and to the baby birds. Before wild creatures were well studied, myths frequently functioned as fact. Some of the logic for the myth is based on the idea that the scent of a human would replace the scent of the animal itself. It would therefore follow if the adult recognized its young only by scent, the adult would not *recognize* that youngster as its own once handled by a human. It may therefore destroy the young or simply not return to the site.

Studies have been carried out for many years on the sense of smell in avian species. From an anatomical standpoint, the olfactory

center of the avian brain is not well developed. This is due in part to the position of the olfactory bulbs within the brain. Extensive studies of birds have shown only a few species with good sense of smell. These include some of the seabirds (albatrosses, skuas and petrels), the Kiwi (a nocturnal, flightless bird of New Zealand), and Turkey Vultures.

The "touching myth" is therefore not true. If the parent has rejected the young, it is for causes other than a human hand touching it.

Parent Rejection - When it Makes Sense

There are several reasons that birds reject their young. The most common include retarded growth, lack of food acceptance or a parasite infestation. If a chick has an abnormality that prevents it from growing into healthy and productive member of the species, it will be abandoned. Survival of the species dictates that an animal that is less than perfect should not exist long enough to reproduce in the natural world. This law of nature serves to strengthen the species. While it may seem cruel in our human society, it makes perfect sense in the animal kingdom. A youngster that cannot keep up with the others must be left behind rather than sacrifice the flock.

In fact, many of the animals and birds that come into rehabilitation centers are those that have been abandoned by their parents due to a problem or injury that we cannot yet detect, but is evident to their parents. These are the individuals that do not live despite the rehabilitator's best efforts. If they do survive, they are "runts" or never quite as vigorous as their wild counterparts.

When extreme weather has had an affect on insect and prey population, youngsters may be killed or eliminated from the nest by their own parent or sibling. Infanticide, killing of ones own young or fratricide, (siblicide) the killing of a sibling is not uncommon in many avian species. Once again the consideration of the flock is the important issue for survival. If there is not enough food to adequately feed four chicks, then one or even two may be sacrificed, allowing the remainder to fledge well-nourished.

If the young have been ejected prematurely by structural nest failure or weather conditions they can be brought back to health and released as a healthy and normal youngster. Replacing a less than healthy youngster into a nest could well put the healthy siblings at risk. In wildlife rehabilitation our first order of business is to do no harm to the wild population. Interfering with the natural selection process is doing harm to the species as a whole.

It is important that an assessment of the youngster be completed before attempting to replace it back into the nest.

Avian Fostering: An Idea Set Up By Nature

The idea of avian fostering is a natural one indeed. Brood parasitism is a term for the regular habits of some birds which lay their eggs in the nest of another. Several species of birds are non-obligate parasites, which means that while they are capable of building their own nest and rearing their young, they at least occasionally lay their eggs in the nest of another bird. Birds that are *obligate parasites* require both the hatching and rearing of all young exclusively by a host parent. Birds from five different families throughout the world practice brood parasitism. These families include ducks, cuckoos, honeyguides, the extensive weaverbird family and the New World Cowbird. In North America alone over 200 species are victim to brood parasitism. It seems reasonable to assume that most birds would be to willing accept the young they are given either by natural or other means. This would include young that vary in size, voice, color and even scent, from natural young.

In his book, "Parent Birds and their Young", Alexander Skutch puts forth the idea that altricial birds don't recognize their young, but rather an attachment to the nest site. He gives the example of colony birds that nest very near one another, yet never mistake their young for those of another bird.

Much work has been done with birds

raised for the pet trade. Many species are eager foster parents and feed any youngster that vocalizes and begs for food. Society finches are notorious for being avid feeders of young of almost any species. Wild birds have been documented feeding the young of birds in species other than their own, which nest nearby. One source cites a Pygmy Nuthatch nesting in a natural cavity just 20 inches from a Mountain Bluebird nest. The bluebird chicks hatched before his own young and he fed the nestling bluebirds. He continued to do so even after his own young hatched. Other documented cases of different species "helpers" are bluebirds that have fed chickadees nesting 40 feet apart. The male bluebird was even seen protecting the chickadee nestbox against other birds and a squirrel attempting predation. It is more common for the young bird to "help" his own parents feed subsequent broods of their own parents. Parental care by "helpers" has been observed in over 130 species. This activity has an obvious benefit for the parent birds attempting to pull off a second brood during the year and perhaps stretching their own energy reserves a bit thin in the process. The second benefit is that the young "helpers" are experienced at parenting by the time they are actually ready for mating and rearing young of their own.

Cross-Fostering?

Cross-fostering is the concept of placing a young bird or animal with a parent not of its own species. Photos exist of cats nursing hamsters and dogs nursing everything from kittens to pot-bellied pigs. Having a parent so different from its species causes problems on many levels. Not only will it create confusion for the youngster, but may create inappropriate species imprinting. Nutrition may suffer as every species has specific nutritional requirements. This can be compensated for if the cross-fostering occurs at a wildlife rehabilitation center, but not if it is in the wild. In the short term the cross-foster adult can provide tactile stimulation, body heat and comfort for the young, but with prolonged care, imprinting and nutrition become increasingly more important.

Peregrine falcons fly again in many parts of the world due to creative efforts of researchers to bring the species back to their native areas, following their dramatic decline from organochlorine pesticides. Cross-fostering was one of the methods used to place Peregrine chicks in their historic habitat with other raptors. Even when placed with congenerics such as the Prairie falcons, problems occurred. While we don't usually consider the diets of Prairie falcons and Peregrine falcons to be that much different, it was enough to cause problems in Peregrine chicks weight gain following placement with the Prairie Falcon foster parents. Prairie falcons have a much wider prey base than do Peregrines, with reptiles and small mammals included to a much greater degree.

The rearing of the young of any species is often more complicated than it appears. Every aspect of growth and development must be considered, from body language and vocalizations, to diet, nesting and procreation. For these reasons I would not recommend cross-fostering, unless there are no other options available.

Basics - Laying the Groundwork

No article on returning young can be complete without stressing the role that wildlife rehabilitation centers play in educating the public. Many times young animals come into contact with people either while awaiting the return of their parents with food or when fledging. Early spring is a good time to prepare handouts that educate the public on what to do when such a situation arises. Veterinarian offices, the local wildlife conservation office and pet stores are excellent places to leave this literature for public access and distribution. Consider doing articles for the local newspaper that prepare people to "expect" to see young wildlife. With the element of surprise lessened individuals are likely to react correctly when contact with wildlife does occur. Preparing the public can be a great help with getting the word out that most of the time wild babies do not need our "help". Situations

that benefit from human intervention can also be addressed.

Wild young are brought into rehabilitation centers for many different reasons. In the case of birds, many times a youngster has fledged naturally, but is incapable of strong flight, so is easily captured. People frequently mistake it as injured or having fallen from a nest. Occasionally the fledgling is in peril due to free-ranging cats, dogs or children in the neighborhood. A wildlife center hotline can help callers determine if the bird is indeed in trouble and needs to be rescued. This service is a valuable part of good wildlife rehabilitation.

Many times the finder already has the bird in hand, and is convinced of the need for intervention. This is the time to get a good history about the youngster, including location and circumstance of its captivity. This information can prove invaluable if you determine it is a good candidate for replacement with its parents. Question the finders about the adult's activity in the area and suggest that the youngster may be able to rejoin its wild family as soon as it is able. Involvement of the finder may be a bonus if the youngster is taken back to the site. In the short term they may well be able to save you time, providing distant monitoring once the youngster has rejoined its wild family. In the long term finders become an informed public that can assist in the future. Many times personal involvement in a rescue is a springboard to wildlife interest in general.

Assessment

It is very important that an assessment of the condition of the young bird is completed as soon as it is brought in. In this way it can be returned to the parent without delay. If the youngster is a fledgling that appears active, has good body temperature, no raspy or open mouth breathing, visible injuries, or wet or matted feathers (indicative of a puncture wound or animal bite), prepare to return it as soon as possible. The longer the youngster stays in captivity the more complicated the reunion with the parent becomes.

Feeding a fledgling is optional if it will be returned within an hour to its nest site. If more than an hour will lapse, it is best to offer food. There are mixed opinions by experts in the field on the subject of feeding an otherwise healthy fledgling. Some feel that feeding the youngster will make it less vocal and thus delay parental response. Others cite the constant nutritional requirements of young birds and the need to maintain the calorie levels for a healthy fledgling. Each center will have its own protocol regarding this point, and as long as the reason for each opinion is clear to the rehabber involved, it becomes a judgment call that is part of the original assessment and individual situation.

If the young birds are naked altricial nestlings that have been without the benefit of a heat source, warm them before taking any other steps. There are many ways to accomplish this, from incubators (90°F) to hot water bottles wrapped in towels. The important thing is that the young birds' body temperatures be brought back to normal before their condition can be correctly assessed. Once the nestling has regained its normal temperature the assessment can continue.

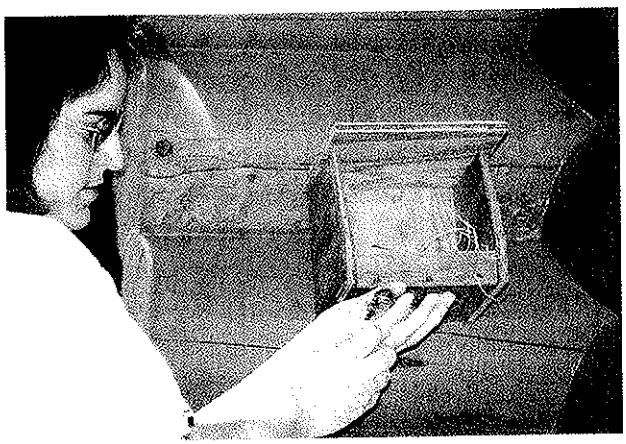
Evaluate the general color of the nestling. It should be pink in color and the abdomen should be round and firm. Dehydration is a serious problem in nestlings, especially those that have been without the benefit of a parent's recent attention. Signs of dehydration are wrinkled skin, sunken eyes and a lethargic posture. Rehydrate the nestling with warmed electrolyte solution. Examine legs, wings and beak for any signs of breaks or dislocations. Internal bleeding will be evident by discoloration under the skin. Check for signs of lacerations or punctures. Clean wounds with a good antiseptic soap. If you find any reason to suspect the bird has been cat injured, begin antibiotic treatment immediately.

In the case of injured young, they will need to be brought back to health before being placed either with its own parents or in a foster nest. Placement is still possible however. Young birds heal quickly and successful fostering has occurred up to the day prior to fledging of the foster nest.

Passerines

Returning a healthy recent fledgling to its own parents is a joyous experience. Prepare the area and human residents for the event. If the household includes a cat or dog, suggest they be kept indoors for the day. Make the youngster visible to the adult birds. Generally within minutes of hearing or seeing its young the adults will approach, alternately scolding loudly and vocalizing to the youngster. At that point the youngster should be released. Give the parents space in which to approach the youngster. Observe the reunion, but unless something unusual occurs and parental aggression is obvious, feel comfortable to leave the area.

If the youngsters to be returned are not recent fledglings, but nestlings that have lost their nest, an artificial nest will have to be erected near the original site. This should be done quickly, within the day, while the parents are still in the area and have not yet given up on their youngsters. The artificial nest should be larger than the wild nest, but not overwhelming in size so as to be an obstacle to the parents. It should be able to hold all the young comfortably once they reach fledging age. There are many pre-made items that can serve as nests. Surrogate nests are easy to find in most hardware or variety stores. Neutral colored baskets; either plastic or woven work well. Nest "shelves" (see photo) can be built with a minimum of effort and skill. Cardboard boxes deteriorate in rain and are not considered an acceptable nest replacement.



10 day old E. Phoebes going to open artificial nest. Photo by Marge Gibson

The "nest" must be capable of draining. In a self-constructed box, holes made with nails will suffice for drainage. Without drainage, chicks can drown or become hypothermic from even a mild rainstorm. Line the nest with fibers or grasses that are familiar to the species of bird you are working with. Towels can cause injury to the young birds' feet or toes and should be avoided. When considering the placement of the "replacement nest" be aware of the species nesting tendencies and follow their guide. Consider predator access to the installed nest. Observe the nest from a distance so your presence doesn't disturb the already nervous parent birds. If the parents have not returned within a half a day the chances are they won't. At this point, unless you have some positive signs that the situation is about to change, remove the young and rehab them.

Fostering young birds to a nest that is not their original nest can be done if you or someone you know has a casual inventory of local nest sites and numbers of young in existing nests. Once again it is important to remember to NEVER overwhelm a nest that has a full compliment of young already. If you are unsure of proper numbers of young for a species, check your field guide. Always leave the birds with less than the field guide states. The age of the natural young and fostered chick should be similar. This method is most applicable for bird banders or researchers that have intimate knowledge of an area. Get to know your local bird club members. If someone is doing research on a species that you frequently deal with, introduce yourself. A partnership of this type can prove to be invaluable.

Precocial Young: Ducks, Geese and Killdeer

Ducks have a wonderful communication system set up with their mother prior to hatching. This communication begins days before the actual hatching of the eggs. The mother vocalizes in an increasing rate communicating with her young. Still in the egg, they respond. In this way the family recognizes one another even before they hatch. This vocal interplay facilitates rapid

formation of the post-hatching filial bond. Each variety is different in terms of how firmly they imprint and how open they are to accepting new members to the family. What is true for some ducks, Mallards for instance, will not be true for Wood Ducks or Mergansers.

Raitasuo discovered that the most important cause of mortality in wild Mallards was defensive attacks of females against Mallard broods other than her own. He goes on to state that within three days following hatch, neither the adult duck nor the ducklings would accept newcomers into their family group. Ducklings that are separated from the family unit, no matter what the cause, are almost certain to perish. Given that information, it would not seem a good idea to unite a duckling with a formed family of ducks, even if it were their own family, once the bond has been created.

Several individuals specializing in duck rehabilitation have confirmed this. Most said it was not usually successful. While the occasional wild duck would accept an orphan, most did not. In fact most would kill the duckling or drive it away from the group.

In contrast, Canada geese do accept same age goslings fairly readily. The family should be observed however to be certain that the gosling has been accepted before feeling reassured that the match has been successful.

Waterproofing for all waterfowl is necessary and should be confirmed prior to any attempt at release.

While not a member of the waterfowl family, Killdeer hatch as precocial chicks as well. There are many anecdotal reports that they foster very well to families that have similar age chicks. The same rules apply for good care as would with any of the avian species. A careful assessment of the chick's condition and close observation following a release are mandatory, either with their natural family or with a foster one. The vocalizations of the chick are very important to alert the parent bird to its presence.

In summary, there is much variation in parental acceptance of precocial young once separated. It would be prudent to use extreme caution when attempting any such experiment with a species that has no documented success with fostering.

Raptors

Raptors are some of the easiest birds to return or foster. Most of the earliest attempts at fostering or returning young were done with raptors. For that reason, documentation is plentiful with most species. Nestbox and artificial nest plans are available at many natural resource agencies. Many of the reintroduction projects of Bald eagles, Osprey and Peregrine falcons have utilized a combination of "hack" boxes and nest platforms. You will want to work closely with your state or federal biologists on nest site locations.

Perhaps the most difficult part of replacing chicks is finding and getting up to the nest itself. The good news it that most raptors that come into wildlife rehabilitation centers are "branchers" or young fledglings that couldn't outrun their rescuers. It is not necessary, or even advisable, to replace raptors of fledging age into the nest. As raptor banders will attest, once the chicks reach an age close to natural fledging they leave the nest abruptly if you climb into it. In these cases, young birds can either be placed in an artificial nest on or near the nest tree, or placed on a branch off the ground in an area where it can "ladder" up to a higher perch more near the nest site. The food call of the youngster will stimulate the parent bird to find it and care for it.

If the baby is very young and not yet thermoregulating, it is important to put it back into the nest. If you believe the chick fell from the nest due to structure instability or weather conditions, put it into the nest with other youngsters. It is not until they are almost fully feathered that a separate nestbox can work. Remember that the young bird has to keep itself warm, and be protected from predators. While the parent birds attempt to do this, if they have two nest sites it is not possible.

Foster parents are important for all young raptors while they are in captivity. If you do not

have an adult (male or female) that accepts young of the species, network with another rehabber than does. This is an important issue. Do **not** attempt to raise a young raptor alone or in complete confinement. Foster parents, even if they are not actually feeding the youngsters, will act as visual role models and provide tactile stimulation. The adult will teach the young raptor specifics, such as vocalization and correct behaviors. This will make the transition to a wild adult that much easier for the chick when the time comes for fostering.



Orphan (left) and Natural Osprey Chicks in Nest
Photo by Karen Hannon

This year alone I have fostered nine Bald Eagle chicks. Only one chick was the natural young of the adults involved. Some of the young (up to 6 weeks old) were placed into nests, but most were released near the site. Most young were injured in some manner from falls from the nest. They often had to be held in captivity for several weeks before they were placed with wild parents. I am fortunate to have a Bald Eagle that is a terrific foster parent while the eaglets are in captivity and recovering. This is important as it maintains an adult bond with the eaglets. By maintaining the correct vocalizations and behaviors in captivity, the chicks know what to expect from the adult once they return to the wild.

All young were banded and observed, and all were accepted and fledged as wild birds. This is most important in Bald eagles and Osprey because of their fishing habits. It is not possible to teach a young fishing bird all he needs to know in an enclosure, no matter how large it is. Teaching hunting using falconry techniques does apply to many raptors, but Bald eagles and Osprey are both high strung and are not well suited to those techniques.

Owlets fledge or leave their nest before they can fly. This is normal for these birds as they strengthen their bodies climbing up and down the limbs of the tree. Too often they land on the ground. In the days before cultured parks and asphalt parking lots, the owlets that parachuted to the ground would simply climb into low bushes, progress to small trees, and end up high in the trees once again. In wild areas, that is still how young owls cope with leaving the nest well before they can fly. However, in cities the young birds frequently find themselves stranded on the ground with little cover. People and dogs find them as they snooze during the day. The adorable puffball appearance of fledgling owls is much to their disadvantage. People are attracted to their soft appearance, so they are frequently taken from their parents and brought home or to rehabilitation centers.

It is important to get owlets back to their territory as soon as possible. Adults will take care of them even if it has been weeks since they were removed from the territory. Most owl species foster young very easily. If the chick is making appropriate owl food begging sounds, an adult will feed it. All the rules discussed with other species apply. The young birds have to be sound physically and not imprinted to humans when the adoption is attempted. Release owlets at sunset, not during the day when they are vulnerable to hazing by crows and others diurnal birds.

Conclusion

Wildlife rehabilitation continues to evolve. Methods change as does our perspective. With some myths dispelled and a better educated public to help, more birds can be reared by their own species rather than in a rehabilitation facility.

By following a few strict guidelines, returning a healthy chick to same species nests, that are not already over-crowded and are the

same age as the fostered chick, you too should have great success with this method.

While putting baby back seems a rather simple concept, it encourages a working knowledge of the natural history and behaviors of the birds you work with, as well as a partnership with the public and other wildlife professionals.



Great-Horned Owl to man-made nestbox on tree, following fall from natural nest. Photo by Mike Winski



Red-Shouldered Hawk chicks, one natural, one fostered, one week after placement. Photo by Marge Gibson

Editor's Note: A companion article will be published in the next issue of the IWRC Journal, called "Reuniting Juvenile Wild Mammals with their Mothers". Watch for it!

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Book Review

Reptile Keeper's Handbook

by Susan M. Barnard
Krieger Publishing Company
Krieger Drive
Malabar, FL 32950 USA
1996
262 Pages $58.50 US

Susan M. Barnard is the lead keeper for reptiles and amphibians at Zoo Atlanta and a licensed wildlife rehabilitator in Georgia. She wrote this book primarily for zookeepers, but it contains significant information for anyone involved in herpetoculture or rehabilitation work.

The book consists of two main sections - the first is a compact, concise guide to basic keeping for reptiles. The second is a detailed set of appendices to be used as a reference in the context of the basic husbandry chapters. The first section covers basic considerations in keeping any reptile - Handling, Transporting, the Captive Environment, Feeding and Nutritional Disorders, Health and Medical Considerations, and finally, Reproduction and Egg incubation. The book then provides a series of detailed tables covering such useful topics as the "Climates, Habitats and Approximate Adult Sizes of the Reptiles of the World", nutritional composition of various foods for reptiles, "Preferred Foods of Captive Reptiles", therapeutics, plants to avoid in naturalistic vivariums and a list of products and suppliers that keepers might need.

In other words, this is a helpful and succinct guide to the successful keeping of most reptiles in captivity backed by a lifetime's experience with reptiles that allows the level of useful generalization that this book provides. While it largely ignores the behavioral aspects of individual species - this is a topic outside the scope of the book.

-Franklin D. Gould-

Letter to the Editor

Holistic Medicine for Animals

Is the IWRC Journal the proper place for papers on holistic medicine? I guess it all depends on what the IWRC wants to be known as and how the wildlife rehabilitation community that supports the IWRC wants to be thought of. If we want to be taken seriously by the scientific community, if we want to be taken seriously by the medical community, if we want to be taken seriously by wildlife biologists, then I think articles on holistic medicine are inappropriate.

If the IWRC wants to be a forum for divergent points of view concerning wildlife medicine, if the object of the Journal is to promote the spiritual aspects of wildlife medicine or to explore inter-species communication, then the articles on holistic medicine should be a mainstay.

Having worked in science for over 30 years and having to go through peer review and documentation and verification as a matter of course for all of my work, I feel uncomfortable with holistic medicine and animals. Animals do not have the advantage of believing that the procedures used on them are going to be beneficial, so they do not have the luxury of the placebo effect. I don't take the placebo effect lightly. It has been verified countless times and is good medicine for a lot of things. But I have serious doubts that our animal patients benefit one iota from our wanting the procedure to work. They deserve more than our good wishes. They deserve the full force of medical knowledge that millions of animals have suffered to give us in the very halls of science that I work in.

-Joe Watson-

Dear Joe,

Thank you for your letter regarding recent articles that have been published in the Journal on alternative medical techniques for wildlife. There were many different methods discussed, including holistic. According to the AVMA (American Veterinary Medical Association), "holistic veterinary medicine is a comprehensive approach to healthcare, employing alternative and conventional diagnostic and therapeutic modalities."

The reason for the IWRC presenting and publishing these articles is to give our members information that may assist them in their work with wildlife. It is stressed in each of these articles that these methods are not purported to be a replacement for regular medical care, but rather to be used to complement those practices. Many of these methods are very real, widely used and proven alternative health care methods.

The answer to your question as to how IWRC wants to be thought of, is very simple. IWRC wants to be thought of as a professional organization whose main focus is education. The journal is intended to provide our membership with the best, most current and useful methods and information that is available. All articles that are submitted for publication undergo a review process before being accepted for publication.

Thank you for your views. We welcome input from all of our readers.

-Mary Reynolds-

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IWRC Board of Directors Election is Coming Up!

IWRC is now accepting nominations or applications for positions on its Board of Directors.

If you or someone you know has a genuine interest in serving on the board of an international wildlife rehabilitation organization and is willing to commit the time and effort to work towards bettering wildife rehabilitation, IWRC will be accepting applications until November 13, 1998. Interested parties may contact the office for an application or you may submit nominations to: IWRC Nominations Committee, 4437 Central Place, Suite B-4, Suisun City, California, 94585-1633, USA.